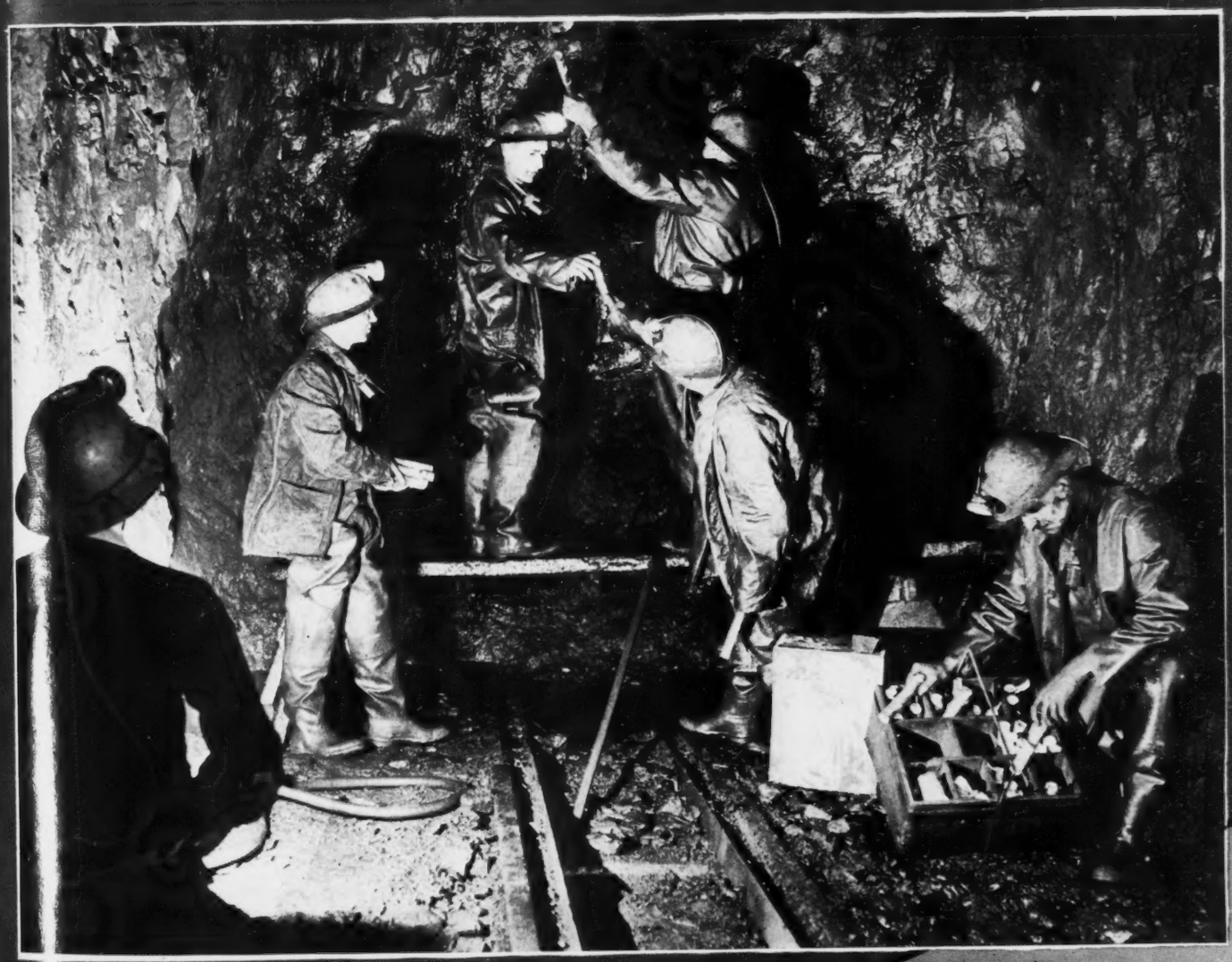
ENGINEERING AND MINING JOURNAL

JULY, 1942



Loading a round for the Inland Iron Co.'s newly opened Sherwood mine, near Iron River, Mich.

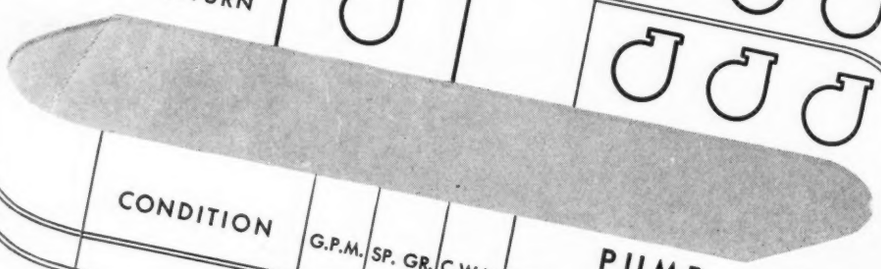
PRICE 50 CENTS

In this issue

Emergency Manganese on the Cuyuna
Cyaniding Concentrates at a Philippine Mine
Planning for Cave Mining • Antimony in Idaho
Pumping Seven Billion Gallons • Asbestos in South Africa
Evaluation of Screen Performance
Complete Contents on Page 35

HYDROSEAL SLURRY PUMPS

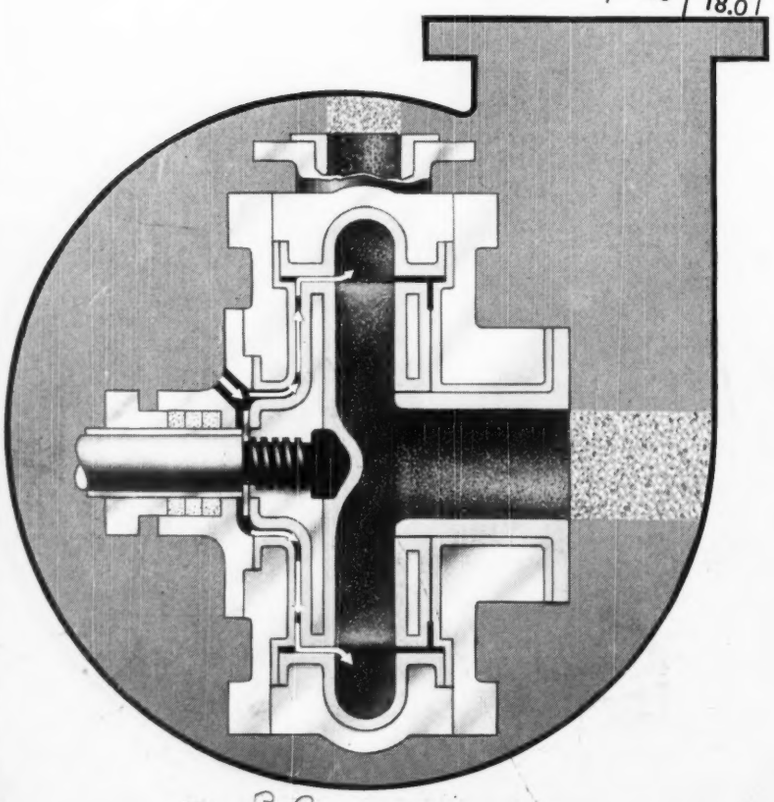
	SERVICE	REPEAT ORDER	ORIGINAL ORDER
A	BALL MILL		
B	CROCKETT		
	COMBINING MIDDLINGS & WETHERILL RETURN		



ON ONE ORDER *then* REPEAT ORDER

MORE

	CONDITION	G.P.M.	SP. GR.	C.W.H.	PUMP TYPE	PUMP SIZE	PUMP R.P.M.	PUMP H.P.	MOTOR H.P.	MOTOR R.P.M.	DRIVE	SPEED RANGE	RECOMMENDED DISCHARGE LINE SIZE	RECOMMENDED DISCHARGE LINE VELOCITY
A	INITIAL	435	1.36	80	V.U.	B-41-1	1050	17.0	25	1760	7-B-6.8/8.0-12.0	990-1170	4″	10.9 /SEC.
	MAXIMUM	525		87	DIS.		1115	22.0						13.4
B	INITIAL	225	1.36	40	V.U.	B-41-1	725	6.8	10	1740	3-B-6.8/8.0-17.6	675-800	3″	10.0
	MAXIMUM	270		42	DIS.		750	7.6						11.2
C	INITIAL	410	1.15	85	V.U.	B-41-1	1070	14.5	20	1760	6-B-6.8/8.0-12.0	1000-1175	5″	6.7
	MAXIMUM	492		88	DIS.		1110	18.0						8.0



R.G.

HREE Hydroseal Slurry Pumps were ordered for each of three applications in a Titanium Oxide Mill, plus one absolute spare to fit any of the three applications; then, three more were ordered to handle increased production, making a total of 13. The above data shows the conditions under which these pumps operate. . . . Hydroseal Slurry Pumps have hydrosealing only on the engine side of the impeller, as indicated by the arrows in the diagram. The Hydroseal Sand Pump, which handles materials larger than slurries, has hydrosealing on both sides of the impeller. Both pumps are completely protected against abrasive action by Maximix Rubber as shown in yellow in the diagram. . . . Write to the nearest office listed below for the Hydroseal Pump Catalog No. 140.

PACKLESS ACID PUMPS AND

HYDROSEAL

SAND AND SLURRY PUMPS

HYDROSEAL, PACKLESS AND MAXIMIX DESIGNS ARE COVERED BY PATENTS AND APPLICATIONS IN THE MAJOR MINING CENTERS OF THE WORLD AND CAN BE PURCHASED ONLY THROUGH THESE COMPANIES

THE ALLEN-SHERMAN-HOFF CO., 229 S. 15th St., Philadelphia, Pa., *Offices or Representatives in most Principal Cities*

AUSTRALIA: CROSSLE & DUFF PTY., LTD., 360 Collins Street, Melbourne
CANADA: CANADA PUMPS LIMITED, Kitchener, Ontario
PHILIPPINE ISLANDS: ATKINS, KROLL & CO., INC., Insular Life Bldg., Manila
SOUTH AFRICA: THE DENVER MACHINERY CO., LTD., 206 Commissioner St., Johannesburg

Southward Ho! From the Rio Grande to Cape Horn stretches the territory that *E.&M.J.* will cover next month, in its Latin American Number. From Texas to Argentina the romance of mining is already centuries old. In Peru it starts with Pizarro—in Mexico with Hernando Cortes; and, in the years since elapsed, chapters have been written in many of the other countries. The chapters of the future remain—these nations still are young, their territories undeveloped. With its eyes ahead, though with its thoughts on today, the *Journal* has therefore prepared, for August, a striking presentation of the current status of the mining industry in the lands to the south. An article on each country—a baker's dozen in all—and each by a well-chosen resident author. Recital of names would take considerable space.

▼

A guide book to mining in Latin America—this special issue for August. For each country the picture will show the scale and scope of present activities, the mineral output, the equipment and processes used; also the matter of labor and laws, the transport facilities, education and technical personnel. Opportunities for mining capital will suggest themselves in regard to the undeveloped mineral resources, especially those that are strategic in character.

▼

Good neighbors all, these peoples! Their language save in Brazil is Spanish; they are of the Americas, American; their thoughts and feelings are the same as our own. Here's to better acquaintance! The Latin American Number, that is to appear in August, will be a valuable aid.

▼

Also in August—the highlights of the month's news from Washington; more about maintenance in Mine, Shop, and Plant; some new Useful Operating Ideas; and the general happenings in industry.

H. C. PARMELEE
Editor

ENGINEERING AND MINING JOURNAL

H. W. CLARKE
Vice-President

Published by McGraw-Hill Publishing Co., Inc.

Contents for JULY 1942

Vol. 143, No. 7

Copyright 1942 McGraw-Hill Publishing Co., Inc.

Editorials	39
Reflections From Washington	41
Manganese for Emergency Use on the Cuyuna Range — Frank F. Grout	43
How a Tough Water Problem Was Handled at Jarbidge — R. O. Camozzi	45
Cyaniding Flotation Concentrates at the Batong-Buhay Gold Mine — R. F. Brown	49
Idaho Mine Increases Strategic Mineral Output — Robert D. Bailey	52
Transport Difficulties in Peru	55
Planning for Optimum Rate of Draw in Cave Mining — Tell Ertl	56
To Evaluate the Performance of a Screen — Rudolf Kohn	60
Asbestos in South Africa — W. E. Sinclair	62
Mine, Shop, and Plant	65
Useful Operating Ideas	68
Personals, Obituaries, Letters	71
Summary of the Markets	74
News of the Industry	77
Equipment News	103

COVER ILLUSTRATION: Loading a round in the newly opened Inland Steel Co.'s Sherwood mine near Iron River, Mich. *Wide World Photo*

McGRAW-HILL PUBLISHING COMPANY, INC.
James H. McGraw, Founder and Honorary Chairman

James H. McGraw, Jr., President
Howard Ehrlich, Executive Vice-President
Mason Britton, Vice-President
B. R. Putnam, Treasurer
Joseph A. Gerardi, Secretary
J. E. Blackburn, Jr., Director of Circulation

Publication Office: 99-129 N. Broadway, Albany, N. Y.
Editorial and Executive Offices: 330 W. 42d Street, New York, N. Y.
Cable Address: McGraw-Hill, New York

Branch Offices: San Francisco, 68 Post St.; Chicago, 520 N. Michigan Ave.; Los Angeles, Calif., 601 Fifth St.; Washington, D. C., National Press Building

McGRAW-HILL PUBLISHING COMPANY, LTD.
Aldwych House, Aldwych, London, W. C. 2, England
Cable Address: Backlash, Estrand, London

CHANGE OF ADDRESS

McGRAW-HILL PUBLISHING COMPANY
330 West 42nd Street, New York, N. Y.

Director of Circulation:
Please change my address on Engineering and Mining Journal

From .....

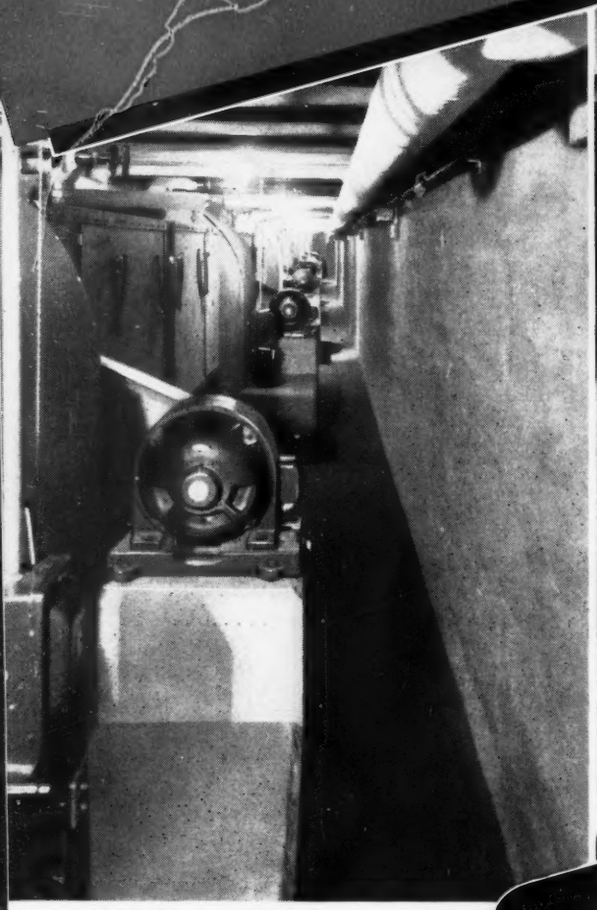
.....

To .....

.....

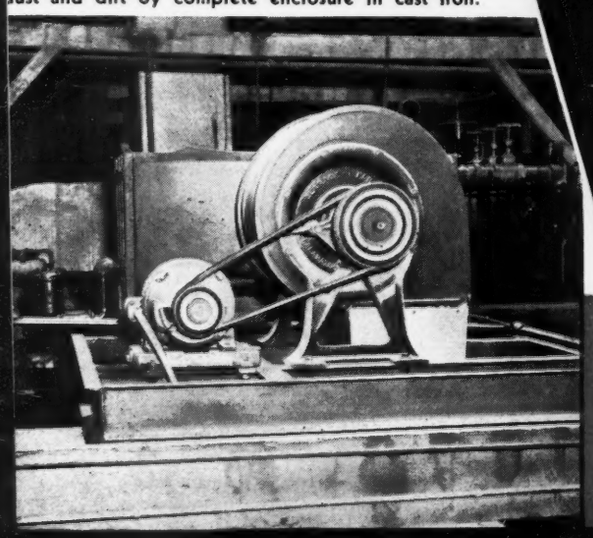
Signed .....

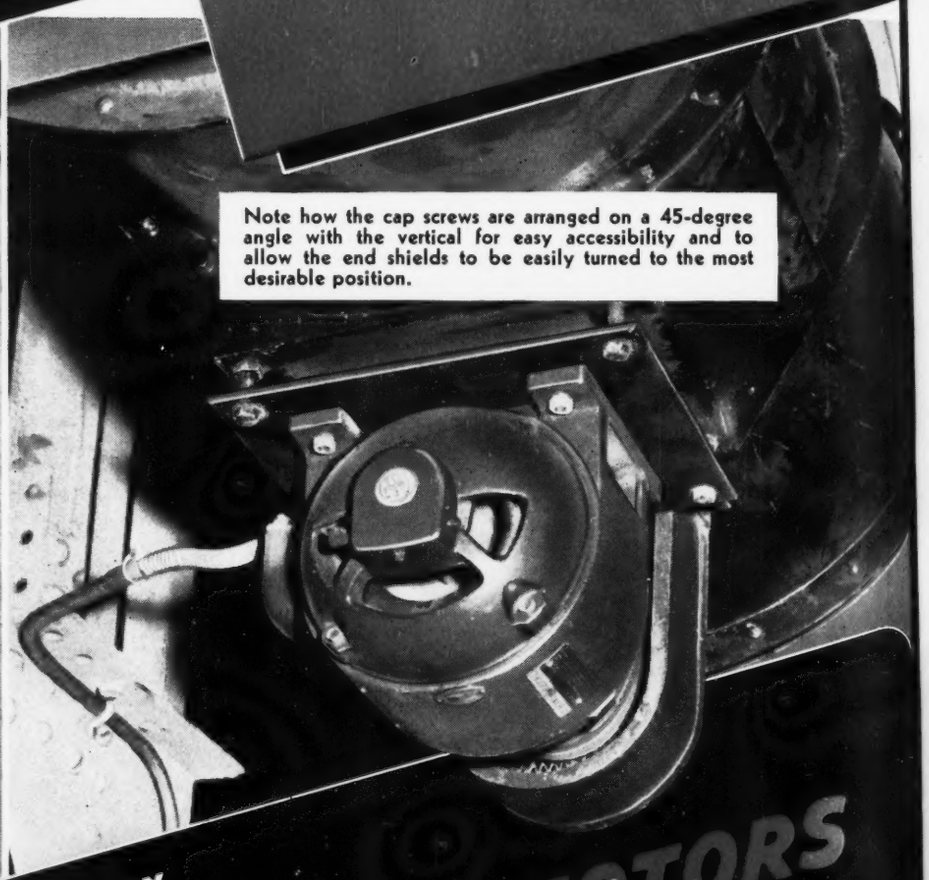
YOU TOO CAN SAVE TIME.



Here are Tri-Clad motors driving fans on continuous dryers in a wood-plant. A double-end ventilation system, plus Formex wire—highly resistant to heat shock—make Tri-Clad an excellent choice for such hot jobs.

Settling dust gets nowhere with this Tri-Clad motor—driving a blower. Its sleeve-bearings are sealed against dust and dirt by complete enclosure in cast iron.





Note how the cap screws are arranged on a 45-degree angle with the vertical for easy accessibility and to allow the end shields to be easily turned to the most desirable position.

SPECIFY

TRI-CLAD MOTORS

THEY GIVE

1. *Extra Protection* AGAINST PHYSICAL DAMAGE
2. *Extra Protection* AGAINST ELECTRICAL BREAKDOW
3. *Extra Protection* AGAINST OPERATING WEAR

Tri-Clad motors are now available up to 100 hp in standard, open construction, and in a wide range of other types and ratings. Ask your G-E representative for complete details, or write General Electric, Schenectady, N.Y.

General Electric and its employees are proud of the Navy award of Excellence made to its Erie Works for the manufacture of naval ordnance.

BUILT FOR PROTECTION FIRST . . . TO LA

ENGINEERING AND MINING JOURNAL

H. C. PARMELEE, Editor

New York: A. H. HUBBELL, Associate Editor; H. H. WANDERS, Market Editor; J. H. EDWARDS, Electrical Editor; EVAN JUST, ROBERT H. RAMSEY, W. N. P. REED, Assistant Editors. Washington, D. C.: PAUL WOOTON. San Francisco: J. B. HUTTL, Assistant Editor; G. J. YOUNG, Consultant

JULY, 1942

Volume 143 Number 7

Two Wars at Once

LAST MARCH *Engineering and Mining Journal* voiced its skepticism of the cleverly baited program of power and mineral development launched by the Interior Department. That skepticism is strengthened by events that have since unfolded. Now Mr. Ickes is "streamlining" the Bureau of Mines and simultaneously seeking legislation to authorize government competition with private enterprise in the oil business, which, along with power and coal, is already partly shackled to his chariot. Can metal mining afford to ignore what is happening to these sister industries?

According to press dispatches, Mr. Ickes has abolished certain technical divisions of the Bureau and has distributed their functions among three regional stations. Whatever the alleged objectives and merits of the reorganization, it is naturally suspect as a political maneuver by the Secretary to shape the Bureau to his avowed policy of national control of the mineral industries. What he has in mind for all of them, after the Bureau of Mines and the Geological Survey are "streamlined" to his taste, may be forecast in the socialistic philosophy of H. S. Raushenbush, one of the Secretary's chief lieutenants in setting up the new program. The following quotations are from Mr. Raushenbush's book, "The Socialism of Our Times."

> "The very subject 'transitional state' implies that we have accepted the alternative of encroaching control in place of the dream of cataclysmic Socialism which has engrossed people dissatisfied with the world for so many years. . . . It is not pleasant to give up that dream of violent triumph. We are sensitive about it."
>
> "This side of revolution we can only take what opportunities we can make ourselves or are offered for illustrations in socialist practice to convince both the workers and the middle class that we are right, that the abolition of the profit system is to their interest and will result in higher real wages, greater security, freedom from wars and other forms of autocracy."
>
> "One good man with his eyes, ears and wits about him, inside the Department—whether it be the Interior where the oil scandal started and the Boulder Dam Bill received most active support, or the Treasury, where the taxation scandals breed and the government tax policies originate—can do more to perfect the technique of control over industry than a hundred men outside."

Practicing his faith, Mr. Raushenbush is apparently "one good man . . . inside the Department" who is assiduously perfecting "the technique of control over industry."

To those who would fight to preserve private enterprise no moratorium is offered in the social struggle. The swarm of socialistic zealots which has found sanctuary in Washington spurns a truce on social issues as frankly as those comprising it reject the ethics of fair play in waging their social warfare.

The mining industry, up to its ears in the vital task of providing the sinews of war, has a moral right to demand that the Administration restrain termite work in the cellar of private enterprise until the war against the Axis is won.

The Truth About Rubber

ALTHOUGH the problems of the rubber industry are outside the editorial province of *Engineering and Mining Journal*, we want to clarify and emphasize a few aspects of the current situation for the information of the mining industry, which has vital use for this material. In the first place, we can say with authority that the rubber shortage is genuine and critical. In fact, the lack of rubber is the most serious material shortage in the war. Every pound of new rubber now in the country, and every pound of synthetic that can be produced this year and next, must be used for direct war production. At the present rate of military demand, no new or synthetic rubber is likely to be available for new civilian passenger tires for about two years. That is why it is so imperative to conserve what rubber we have and make the most essential use of it.

The drive for scrap rubber probably will be disappointing in its yield. Estimates have ranged from 400,000 to 10,000,000 tons. The latter is obviously fantastic because total imports of rubber into the United States since 1839—over one hundred years—amount to only 11,890,000 tons. If the drive yields 500,000 tons

of scrap rubber, the authorities will be pleased; if only half that much is forthcoming, they will not be greatly disappointed. But whatever is salvaged will not be available for non-essential civilian use.

Don't be confused by conflicting stories circulated about synthetic rubber. It isn't necessary to have an intimate knowledge of the complex organic chemistry involved in order to understand the basic situation. Synthetic will be made in appropriate quantities by several processes from different raw materials derived from the agricultural and mineral industries. Technical decisions will be made by competent chemical engineers and not by Congressional committees, although the latter may make more noise. By the end of 1943 it is expected that plants will be built and producing synthetic rubber *at the rate* of 800,000 tons a year. This is about the rate at which the United States was importing rubber before the war.

The whole matter boils down to this: there isn't enough rubber — natural, synthetic, reclaimed—to satisfy military and essential civilian demand. The best hope for meeting non-essential needs is to lick the Japs, and meantime treat your rubber products well.

Mining Branch, WPB, Still Needs Your Help

ON ANOTHER PAGE we publish a letter from Wilbur A. Nelson, administrator of the Mining Branch, WPB, thanking equipment manufacturers and mine operators for their cooperation in making advance estimates of supplies and equipment needed for 1942, and urging them to intensify their efforts in this direction. Manufacturers generally have been more keenly alive to the situation than have the operators, despite the fact that the self-interest of the latter group is vitally involved in the success of the plan.

As we pointed out in our April number, the mining industry has rightly been favored in the matter of priorities because Dr. Nelson understood the vital importance of metals in the war and was in a position to convince the authorities that mining should be placed on a par with munitions. He was instrumental in obtaining the excellent priority orders under which the mining industry now functions. At the same time he cautioned the operators to keep their suppliers fully advised in advance of their needs, quarter by quarter, so that raw materials could, in turn, be allocated to manufacturers.

Emphasis is now put upon the absolute necessity of complete cooperation by the operators in forward planning and estimating. Without it the Mining Branch will find it increasingly difficult to maintain the high priority ratings enjoyed by mining, and may have to yield to measures of allocation. Control of materials is becoming more and more stringent, as reported in this issue by our Washington News Bureau. So the more fully the mining industry cooperates with the Mining Branch, the longer will it postpone the day of working under an arbitrary materials requirements plan.

Campaign for Safety

WAR TAKES ITS TOLL of life and limb not only on the battlefield, but also on the industrial front. Accidental deaths and injuries among civilians tend to increase in frequency and severity in war time because industrial employment expands rapidly and large numbers of men and women engage in unfamiliar occupations. They are without knowledge of the hazards to which they are exposed, and frequently without instruction in practices that would avoid many accidents.

Records of the National Safety Council clearly show the upward trend. In 1941 the rising accident toll claimed 101,500 lives, permanently disabled 350,000 persons, injured 3,750,000 workers, lost 460,000,000 man-days of work, and cost the nation an estimated economic loss of $3,750,000,000.

The record is staggering, but not inevitable. Something can be done about it. By concentrating the attention of management and workers on safety measures, the record can be reversed and the appalling loss reduced. This is the goal of a national safety campaign proclaimed by the President, advocated by the War Production Board, and sponsored by leaders of business and industry.

The War Production Fund to Conserve Manpower is the medium through which $5,000,000 is to be raised by industry and administered by the National Safety Council in an expanded program of safety throughout the country. In this timely movement the representative of the non-ferrous metal mining industry is Robert C. Stanley, president of the International Nickel Company. The Fund's Executive Committee, of which he and other prominent business men are members, has for its chairman W. A. Irvin, former president of the United States Steel Corporation. The list is at once an indication of the importance of the movement and assurance of its success. We commend the purpose of the Fund to the non-ferrous metal mining industry and bespeak generous contributions to its vital purpose.

Reflections from Washington

Washington News Bureau

THE WAR AGENCIES are getting over their adolescent growing pains. The recent realignments in WPB evince a settling down to more coherent and routine operations. The tooling-up and conversion stages are over; from now on the job for the war agencies is to coordinate the operations of the machine that has been slapped together.

This explains the drying up of the industry operations branches, whose work is finishing now that the industries they were named to regulate have been converted to war work. This explains why the bulk of production and procurement work is being concentrated under uniformed civilians within the armed services. The machinery is installed; the changes from now on are in the demands upon it, based upon the relative need for different types of matériel. Henceforth, WPB can concentrate on the materials production and allocation jobs, with the commodity branches increasing in stature as the industry branches wither.

This is the industrial side of the picture. There is another—the political side. Not garden variety partisan politics, but the political art of dictating to the bulk of the population and making them like it. Up to now, the kicking around has been largely of business, and the public has scarcely regarded itself as a party at interest. Regimenting the majority into an economic pattern is a vastly different job, particularly when it involves indirect rationing—of gasoline to save rubber, for instance. It must be done in such a way that on election day the majority doesn't revolt—not simply to keep the present administration in power, but equally to prevent upsetting of the war program.

Labor-Management Committees

WITH CONSIDERABLE FANFARE, the War Production Board officially extended the War Production Drive into the non-ferrous metal mining industry in June. Purpose is simply as stated in Washington, to spur management and workers alike into producing more and more of the basic metals which are now more precious than gold.

The War Production Drive is a plan sponsored by WPB boss Nelson himself to make working harder a cooperative game. It has been under way in the manufacturing field for several months; by the end of June more than 1,000 plants had formed employer-employee committees to conceive and execute promotional stunts for stepping up output. In virtually all plants where the committees are operating, reports have shown considerable increases in production and improved esprit de corps; there have been only isolated instances where either labor or management have attempted to take advantage of the drive for their selfish ends.

Send-off of the drive in the mining field occurred in Butte on June 13 (Miner's Day) with a management-labor ceremony at which formation of the first four mining industry committees, for Butte, Anaconda, Great Falls, and East Helena, was publicized. Representatives of the government, the Anaconda management, and both CIO and AFL unions participated in the demonstration, which was opened by a telephone address by Donald Nelson. WPB wants the initiative in forming committees and signing up for this campaign to come from the mines, but has set up a special labor-management unit in Washington to lend whatever spark-plugging is required.

Rubber Shortage Is Real

DESPITE publicity to the contrary, rubber is the No. 1 war material bottleneck. It has replaced copper in the scarcity ranking by top war officials; there has been no confusion nor disagreement in their public utterances, nor in their steady trend toward stricter conservation regulations. The simple fact is that until the synthetic plants come in, the United Nations—all of them—are almost totally dependent upon the United States stockpile. And the synthetic plants cannot, even to please Senator Gillette and the grain bloc, be put into full-scale operation short of the winter of 1943-44. This means production in calendar 1943 probably won't be up to the minimum amount of 350,000 tons required—in addition to the stockpile and the fullest possible utilization of reclaimed rubber—to keep the war machine and essential civilian operations supplied until the full synthetic output is attained. Actually, it's no real military secret that medium tanks today are being built with steel treads, instead of rubber, so that the Army's allotment of crude can go for more vital purposes.

This was the situation into which the President injected himself in June to sponsor the two-week scrap collection campaign in order to determine just how much of a hidden stockpile actually existed. Advance estimates ranged from 200,000 to 500,000 tons, but defense officials handling the rubber problem were sure that whatever was collected wouldn't be enough. Most informed parties felt that the President's real purpose was to let the country convince itself that nation-wide gasoline rationing to save tires is necessary.

Trucking Restrictions

WHILE enforced conservation of private auto tires was the mouse in the political cat-and-mouse game. no such dillydallying delayed conservation steps in the field of commercial carrier operations. Primarily because of the rubber situation, and also because of vehicle shortages, the Office of Defense Transportation has ordered trucks to carry pay loads both ways and to increase their per-mile tonnage by 25 percent over the monthly average of 1941. Only worthwhile exemption from this mandate applies to private carriers on hauls of less than 25 miles. This exemption apparently takes care of most off-the-highway mine haulage, but it overlooks many an on-the-highway load of ore bound for concentration depots, particularly those of small operators to smelters, custom mills or Metals Reserve collection centers. Protests from mining circles were being considered by ODT early in July. The industry can expect that essential mining transportation will not be blocked, inasmuch as the government wants the fullest output of such mines, but mine operators will be expected to cooperate by cutting their rubber consumption to the barest possible minimum.

Manpower Administration

FIRST EFFORTS will be made to solve all problems of providing adequate manpower (and woman-power) for the armed forces and the production forces on a voluntary basis. Manpower Commissioner McNutt wants to work with suasion, not by fiat, if at all possible. But he promises that if voluntary cooperation doesn't work, force will be used. Industry will have to lower its sights on what workers it can do without. The Army is going to take upwards of five million young men and expanding war industries will require several million more in personnel, of which a large proportion will have to be women or older and less efficient men. On the

other hand, essential industry—and mining is thus classified—can expect protection from McNutt against excessive and crippling raids by selective service, and by other industries. The Bureau of Mines has prepared a list of critical occupations in the metal-mining industry for submission to Selective Service headquarters. This may have been issued by that agency as a guide to local boards in acting upon occupational draft deferments by the time this issue is printed. Mine operators must realize, however, that no such list provides automatic deferment for any worker; it serves only as a guide to help local boards decide "necessary man" cases presented to them by employers.

Silver Troubles

EFFORTS to convert silver to war work were still running into snags at the end of June. Secretary Morgenthau, backed by WPB boss Nelson, wants to lend the government's bullion for use as a copper substitute in war plants, principally lining for vats in synthetic rubber plants. This would require an amendment to the Silver Purchase Act. In return for Morgenthau's pledge not to attempt to upset the government's purchase policy for the duration, the Senate silver committee first agreed to approve an amendment, but balked at Morgenthau's phraseology for fear it might permit the Administration to go back on Morgenthau's pledge. The committee undertook to rewrite the amendment.

Another silver "deal" was Morgenthau's request of June 18 for permission to sell 500,000 oz. to friendly foreign countries for coinage. Senator McCarran, of Nevada, promptly suggested a flat price of $1 per ounce, which Morgenthau argued would be unacceptable in view of the existing world price of about one-third this figure.

Manganese Supply Assured

BETWEEN the growing stockpile and domestic and Cuban production, WPB can see an assured supply of manganese for at least two years, even if imports now flowing should be completely shut off. The stockpile is still growing in spite of the fact that demands for the metal are also increasing. Two years is considered adequate time to develop further domestic sources sufficiently to meet estimated demands for several years. Such deposits as Cuyuna, Artillery Peak, and possibly Chamberlain are in reserve for future development. The Three Kids, Nev., deposit is now under development.

To encourage production from smaller operators, Metals Reserve has established several depots to purchase manganese and chrome ores in small lots, settling whenever a 10-ton pile is accumulated by any seller and analyzed. The depots are at Phoenix, Ariz.; Auburn and Tracy, Calif.; Salida, Colo.; Butte, Mont.; Battle Mountain, Nev., and Deming, N. M. Depots at Yreka, Calif., and Seneca, Grants Pass, and Coquille, Ore., are already in operation. In addition, Metals Reserve has announced a program of purchasing millable ores containing 15 to 35 percent Mn at sites where concentration mills are in operation or being built by WPB. Settlement is generally at the base price of 40c. a unit for 25 percent manganese. Depots are at Batesville, Ark.; Elizabethton, Tenn.; Butte and Philipsburg, Mont.; and Deming, N. M. Idea is to provide miners an immediate outlet for their ores and to insure an ore stockpile for the mills when they are completed.

Tariff Hedge Clipped

AN EXECUTIVE ORDER from the White House, dated May 30, 1942, grants authority to the Secretaries of War, Treasury, Agriculture and Commerce, as well as the Metals Reserve Co., to bring war materials into the country free of duty. Previously, only the Secretary of the Navy had this power.

The action is taken primarily to expedite movement of critical materials at the borders. Secretary Jones has announced that none of these commodities will be sold under OPA price ceilings, and thus will not be used to depress markets. It can be assumed by the mining industry that this policy is good for the duration of the war; after peace, the government policy will depend upon political factors not yet crystallized.

Production Requirements Plan

THE PRIORITY SYSTEM, based on graduated preference ratings, has only partly succeeded, because WPB has not been able to correlate the competitive needs of various industries as effectively as it has graduated the needs within each industry. Thus, in the over-all picture, some users have starved for supplies which others, less essential to the war effort, have been able to secure.

To meet this situation, WPB is applying the Production Requirements Plan to a wide range of industries which have heretofore been managed under separate preference rating orders. For the third quarter of 1942, every manufacturer using more than $5,000 worth of metals in any of 50-odd specified shapes or forms—usually the first step beyond ingots—will be required to obtain all his preference ratings under the PRP mechanism, using Form PD-25a. The purpose is to make each industry live within an allocation previously determined, according to available supplies, by the WPB Requirements Committee. Control will be at or near the first fabricating level; allocation of ingot metal will continue as heretofore, under the various "M" orders.

For the third quarter at least, this swing to PRP has not included the basic industries. Thus, the P-56 and P-73 repair and maintenance orders for the mining and smelting industries remain in effect. However, if a smelter expects to use more than a total of $5,000 worth of metal in listed forms per quarter for repair, maintenance, and processing into unlisted forms, it must apply for these needs under PRP on Form PD-25a.

Accompanying this alteration of priorities precedure is the uniform classification system which, when it gets fully into use, is intended to identify each pound of material through all manufacturing processes from mine to cannon. This classification machinery requires the cooperation of every business and industry. All end-product uses have been divided into 23 groups. Industrial purchase orders, from whatever source, must now carry an appropriate number plus a letter symbol indicating the type of end use.

Mine operators will be expected to label their purchases with the identification: DP 8.10. The "DP" stands for domestic purchaser; the "8" for the classification: production and preliminary processing of raw materials; and the ".10" for the subdivision of that group covering production, including mining, and preliminary processing, of all metals. It is emphasized that the classification numbers have no relationship to relative importance; they are merely labels by which WPB will be enabled to trace the flow of materials.

If this complicated procedure fails to function effectively, resort will probably be had to the system first advocated by the Army and Navy, of non-graduated certificates to essential users, leaving the rest of industry to scramble for whatever is left over.

USBM and USGS

BOTH the Bureau of Mines and the Geological Survey are tentatively given additional appropriations for specific war work during the 1943 fiscal year which began July 1. The Senate added to the Survey's budget items of $500,000 for wartime geological surveys and $400,000 for additional studies of strategic and critical mineral resources.

The Bureau of Mines was awarded a $650,000 fund to investigate and test processes for producing alumina from clays and alunite, and an additional $275,000 over normal budget figures for investigating deposits of critical and essential minerals in the United States and its possessions.

Another $600,000 appropriation will finance a pilot plant and experimental work on gaseous and solid

(*Continued on page* 78)

Manganese for Emergency Use on the Cuyuna Range

State Survey data indicate an important tonnage suitable for concentrating to ferro-grade but too high in silica for normal times — Green carbonate slate has possibilities

Frank F. Grout
Department of Geology and Mineralogy
University of Minnesota
Minneapolis, Minn.

THE Minnesota Geological Survey undertook in 1941 to check the estimates of low-grade (5 to 15 percent Mn) manganiferous iron-bearing rocks on the north Cuyuna range[1] which might well be used to concentrate into ferro-grade (45 to 55 percent Mn). Most of the published estimates[2] of reserves have omitted reference to the formations carrying less than 45 or 50 percent of combined iron and manganese. It seems best to most of the miners and steel makers who know the range that merchantable ores carrying 50 percent of the combined metals should continue to supply the normal and now increasing demand for manganiferous iron ore. If ferro-grade is to be made, it is probably best to use non-merchantable formation, too high in silica to carry 50 percent of the combined metals. A review of all the old drilling data available is the basis of the following discussion. Grateful acknowledgment is made to operators and engineers who have contributed.

Underground mining is so costly that it seems likely early operation of any such manganese concentration plant on the Cuyuna range will depend largely on supplies within a few hundred feet of the surface. The tendency on the range is clearly to use open pits wherever possible.

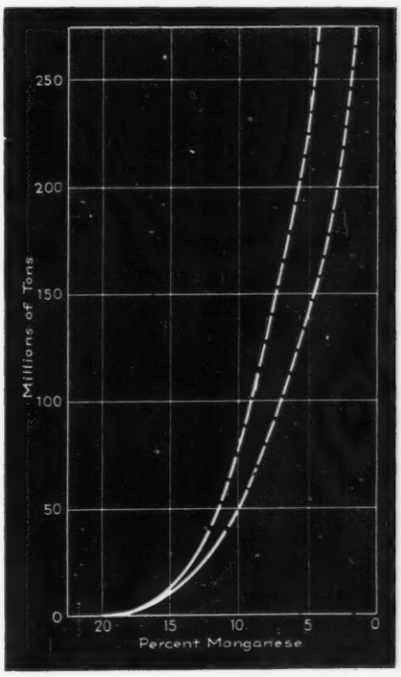
1. The "Black" Oxidized Formation —It may now be reported that the files of the Minnesota Geological Survey include drill data and assays which, by the usual methods of estimating, indicate 8,000,000 or 10,000,000 tons of oxidized "black" formation[3], assaying from 8 to 12 percent manganese, but containing too much silica to be merchantable in normal times; all in bodies from 300 to 3700 ft. long and in steeply dipping layers or lenses from 50 to 300 ft. thick; and all lying under less than 70 ft. of "surface" sand and gravel. Several recent drilling campaigns and some older ones are not available to the Survey and might raise the total appreciably. The files are available to authorized government officials in planning for development of such materials.

Add to this the associated merchantable manganiferous ores, the associated merchantable iron ores, the known extension of some of the deposits to greater depths, and the probable extensions laterally that have not been drilled, and it seems clear that the range has a supply for making ferro-grade for several years. Clearly the engineers on the range who question whether there is 1,000,000 tons of material for concentration of this sort must be thinking of merchantable "black ore." On the other hand, these who estimate several hundred million tons no doubt include the fresh unoxidized formation, which may assay 3 to 8 percent manganese in enormous tonnages. This may perhaps be justified if the grade and character are mentioned along with the tonnages, but it is the "black" oxidized material that has been most extensively tested in recent leaching experiments.

Few if any of the deposits so far discussed are in open pits from which the manganiferous "black" formation can be shoveled. If and when a plant is started for concentration of such material, stripping (or elaborate development) to open the deposit should begin promptly, because both the plant and the mine may take several months to reach satisfactory working capacity.

2. The "Carbonate Slate" —(This formation is also called green cherty carbonate, banded green slate, etc.) There are several statements in the published papers on the geology of the Cuyuna range that the manganiferous iron ores result largely from the weathering of a carbonate layer, or long lenses of carbonate, which carry manganese and iron in the original carbonate. The oxidation, leaching, and enrichment of carbonate to ore by natural processes may be seen to have occurred in a small way in a spur projecting into the North Hillcrest pit. Few other places are now exposed where such relations

Approximate form of curve relating tonnage and percent manganese in all kinds of deposits on the Cuyuna Range, within easy reach of surface. Larger tonnages not based on exact data



Published by permission of the Director of the Minnesota Geological Survey.

[1] E. C. Harder and A. W. Johnston: "The Cuyuna Iron Ore District." Minn. Geol. Survey Bull. 15, 1918. On page 134 the authors note that the south range has not shown much manganese.

[2] Carl Zapffe: "Reserves of Lake Superior Manganiferous Iron Ores." *Trans.*, A.I.M.E. Vol. 75, pp. 346-371, 1927. He says on page 365, "Who would venture a guess?" as to the tonnage of non-merchantable reserves.

[3] The differences between black and brown ore types were described by Carl Zapffe in "Manganiferous Iron Ores of the Cuyuna District," Minnesota, T.A.I.M.E. Vol. 71, pp. 371-385 (1925). The same or similar characters distinguish the oxidized rocks that are too lean to be merchantable.

Representative Analyses of Carbonate Slates

	1	2	3	4	5
Mn	4.14	7.99	9.10	1.76	2.24
Fe	26.55	25.86	22.31	28.06	27.59
SiO_2	26.20	28.14	34.92	30.15	40.70
Al_2O_3	[illegible]	2.70	1.65	.40	2.24
CaO	1.92	1.34	1.12	1.25	1.28
MgO	4.92	2.05	2.72	4.77	2.77
TiO_2	....	....	....	0.02	Trace
P	0.224	0.193	0.063	0.290	0.250
CO_2	14.06	14.38	13.40	24.65	10.21
H_2O+	....	....	....	0.36	....

1. Trench, north part of Sagamore pit
2. North wall, Arko pit, 1941
3. Cross cut, Merritt mine, 178-foot level
4. Kennedy mine
5. Mangan No. 2 mine

} Bull. 15, Minnesota Geological Survey

can be seen. And it is not impossible that cherty (as well as carbonate) original beds may have carried some manganese, which natural processes could have concentrated to ore. The relation of manganese ore to carbonate formation, however, has been stated so often that a study of the carbonate is clearly in order. Interest has been expressed by geologists of the United States Geological Survey and of the Defense Commission.

Little seems to have been done with the metallurgical problem of extraction of manganese from such carbonate slate. Roasting turns it largely to oxide, after which manganese can be leached.

A study of the drilling records in the Survey file shows that they are wholly inadequate to determine the occurrence, thickness, and grade of these carbonate rocks, though the amounts are known to be very large.

About 70 new samples of these green slaty rocks were taken by Minnesota Geological Survey parties in 1941, from exposures in the mines and from available cores of old drilling. They contain manganese ranging from a fraction of 1 percent to 15.67 percent. Many samples assay from 3 to 8 percent. These agree reasonably well with earlier estimates, but clearly show that the carbonate in the area from Sections 27 and 28, T. 47 N., R. 29 W., to Sections 9 and 10, T. 46 N., R. 29 W., is notably higher in primary manganese than most of the carbonate in outlying areas.

This area is the same as that in which the best of the "black" oxidized deposits are known, and the same as the area in which the surface cover of sand and gravel is thinnest. All these combine to indicate a most favorable place for operation.

The distribution of the green carbonate slate is wide, but not all the green slate is rich in carbonate or manganese. Drill records commonly stop when they reach the green slate, and such records are incomplete. At the Milford mine and at the Pontiac mine the cores show considerable thicknesses of carbonate slate in continuous beds. Open pits show carbonate beds as much as 50 ft. thick in the Arko, North Hillcrest, East Mahnomen, and Sagamore mines, without exposing the contacts with other beds either above or below. Some investigators believe there are manganiferous carbonate beds up to 100 ft. thick at two horizons. An attempt is being made to check the horizons and thicknesses by further drilling, a liberal grant having been made from the research funds of the Graduate School of the University of Minnesota.

The continuity of the belt of original carbonate slate is strongly suggested by the wide distribution of known occurrences in the range and the fair uniformity of bedding in the slates exposed in the mines. On the other hand, there are known to be gaps in the belts of formation, faults can be seen in the mines, and in many places the carbonate has been found to be deeply oxidized.

Tonnage cannot be "estimated" by approved engineering methods, but some guesses based on reasonable assumptions may serve to show the large tonnage probably involved. If a bed 100 ft. thick could be traced 15 miles and, dipping steeply, could be mined for 200 ft. below the surface sand and gravel, it might yield perhaps 140,000,000 tons. If the gaps in the belt reduce it one half, there is still a large tonnage. It is further probable that two beds occur, and geologically it seems reasonable to guess at present that much more than 100,000,000 tons carrying 3 to 8 percent manganese may be available. At depths which are below 200 ft. the tonnage is much greater, but not likely to be available in open pits. Clearly, the formation below the zone of oxidation may contain a reserve of available manganese greater than that in the oxidized zone.

Furthermore, the roasting suggested in the foregoing as a preliminary to leaching will notably increase the percentage of metal in the residue. One sample from the Merritt mine had its manganese content increased from 6.73 percent to 8.0 percent by a roast treatment such as is planned as a preliminary to one of the leaching processes now under consideration. Several available bodies might assay 10 percent manganese after roasting. These may well be included in the emergency reserves if a method can be found to extract the manganese at moderate cost.

A Nickel Deposit Near Riddle, Ore.

THE RIDDLE NICKEL DEPOSIT, on the slopes of Nickel Mountain about 5 miles northwest of Riddle, Douglas County, Ore., was discovered in 1864. Since then much prospecting and preliminary development work has been done, but no ore has been shipped except small lots used for metallurgical tests. The deposit is described by William T. Pecora and S. Warren Hobbs in U. S. Geological Survey Bulletin 931-I.

This deposit is a layered blanket, containing the nickel silicate garnierite, which rests upon unserpentinized peridotite. This blanket ranges in thickness from a few feet to a maximum of 60 or 70, but with an average of about 20 ft. It is best developed on terraces, flats, and gentle mountain slopes above an elevation of 2,000 ft. It consists of three layers: a top brick-red soil layer, an intermediate thick yellow limonitic layer with some quartz-garnierite boxwork, and a root layer composed of quartz-garnierite boxwork in nearly fresh bedrock that is a transitional phase between weathered material and fresh peridotite.

About 162 acres of ground are underlain by a blanket containing over 6,000,000 tons of material, 1 to 2 percent of which is probably nickel. Eighty thousand tons have been proved to contain 2 to 3 percent of nickel, and 75,000 tons have been proved to contain 1 to 2 percent of nickel.

▼

Nickel at Snipe Bay

A NICKEL-COPPER DEPOSIT at Snipe Bay, Baranof Island, Alaska, has recently been examined by the United States Geological Survey. Snipe Bay is a northeastward-trending indentation of the west coast, about 46 miles in an airline southeast of Sitka. The deposit consists of a dark, coarse-grained mass of basic igneous rock intruded into older quartzite and quartz schist. Neither the size nor the grade of the deposit is adequately known, but, from what was observed in natural exposures and in a few prospect holes, it is estimated that to a depth of about 130 ft. below the lowest point on the outcrop there is a reserve of at least 430,000 tons of low-grade nickel-bearing material. The deposit as a whole probably does not contain more than 0.3 percent each of nickel and copper, and, although it is fairly well situated for large-scale, low-cost development, it probably is too small and its percentage of nickel and copper too low to permit the profitable recovery of these metals at present prices.

How a Tough Water Problem Was Handled at Jarbidge

Sinking the Gray Rock shaft involved pumping seven billion gallons

R. O. Camozzi
General Superintendent
Gray Rock Mining Co.
Jarbidge, Nev.

SITUATED among rugged mountains 6200 ft. above sea level, near the floor of Jarbidge Canyon in Elko County, Nevada, is the site of the 1100-ft. Gray Rock shaft. This shaft has three compartments, each 4½x5 ft. in the clear.

The formations penetrated consist of 263 ft. of impervious rhyolite rocks of recent age on the surface, followed by silicified, brittle, lower series rhyolites, which have been subjected to large-scale faulting in all directions. The mechanics of the rocks are extremely important in that the impervious strata represent rocks which are unable to withstand their own weight and consequently flow and mould themselves, thereby closing all major openings to water passage. On the other hand, those of the lower brittle series when subjected to large-scale rupture, shatter badly, with the major faults remaining open to the passage of water so that they drain tremendous areas of water strata. The complexity of this faulting and the particular adaptability of the rocks to the passage of water are the worst I have ever experienced. Furthermore, the boulders and loose breccia in the gaping faults present a very unfavorable setting for drilling of deep unwatering boreholes to place long columns of suspended pumps, inasmuch as the great washing action of thousands of gallons of water per minute would jam or lock these units, preventing their removal for salvage or repair. Also the amount of cement necessary for grouting purposes, if grouting were used, would probably be limitless. The latter would further be impractical because the entire drainage volume would necessarily be pumped later from the bottom level, requiring a great deal more power than would be the case if successive amounts of water were pumped from various levels.

The Water. Seven billion gallons (7,000,000,000 gal.) of water was pumped while sinking 1100 ft. of shaft and developing 2300 ft. of short wet laterals. Fortunately, water temperature averages about 80 deg. F. with the temperature gradient of the rocks showing a downward increase of 1 deg. F. for each 75-ft. vertical interval. The maximum pumping plant installed lifted 7100 g.p.m. to surface, which is roughly 42,000 tons per 24 hours; with the total of 7 billion gallons being equal to a body of water with a base of one square acre and a height of 22,000 ft. Assuming that one kilowatt-hour equals 2,655,000 ft.-lb. of energy and that the largest part of the water was pumped around 700 ft. vertically, the large power requirements are quickly visualized, thus, after multiplying the kilowatt-hours by the rate in cents, or 100 ÷ 65.

$$\frac{7{,}000{,}000{,}000 \text{ gal.} \times 8.33 \text{ lb.} \times 700 \text{ ft.} \times 100}{2{,}655{,}000 \times 65} = \$236{,}000 \text{ approximately}$$

The successive amounts of water encountered continuously drained the surrounding country as shown by the data in Table I. Emphasis is here placed on the tremendous flow (13,000 g.p.m.) above the 1,000 level from a water-table pressure showing 330 ft. of vertical section.

Peculiarities of the water were as follows: All-year temperatures were about 80 deg. F. in spite of the extreme summer heat of 110 deg. and —30 deg. F. winter temperature which gave a wide change of temperature for surface run-off. The water was also rather actively corrosive to steel and iron. Hoisting cables during the sinking to the lower levels were changed as often as every six months in spite of great care and constant lubricant being applied. Upon exposure to air, moreover, heavy encrusting minerals formed. The presence of 25 parts of CO_2 per million parts of water along with certain carbonates and sulphates points to a deep-seated origin of most of the water within a semi-stagnant basin. Small springs resulting from the impounding of the surface run-off passing over this basin eventually dried up as far back as one mile from the shaft.

Table I. Water Handled in Successive Periods

Date	Total Water Level	Known to Exist, G.p.m.	Pumped to Surface, G.p.m.	Water Table Lowered, Ft.
Aug., 1938	300	1200	1200	60
Nov., 1938	400	3750	3750	106
Sept., 1939	600	6100	4300	291
June, 1940	800	9200	6100	400
Aug., 1941	1000	13000*	7100	670

* See page 46 for control of excess water over pumps.

The lowering of the water table, instead of unwatering a vertical section of a shape something like the inverted truncated section of a cone, seemed to step off sharply as shown on Aug. 2, 1930, when the water table stood at 340 ft. below the drainage tunnel on the west side of the shaft, whereas, on the east side, it stood at 281 ft. below the same drainage tunnel. This is no doubt merely complex proportioning of water relative to faults as well as more rapid drainage of shattered zones not directly connected to faults.

Power. Continuous power was supplied by a 74-mile 66,000-v. 3-phase line which crossed a sparsely inhabited semi-desert stock range country. In winter this region was often the site of severe blizzards and in summer months it was disturbed by many intense lightning storms. These conditions at times caused serious and costly power outages, thereby requiring installation of steel water doors in underground laterals and a fractional auxiliary diesel power plant to keep the shaft unwatered during such outages. Our primary substation was capable of 4000-hp. output, while that of our protective diesel plant was 1100 hp.

In spite of the protection of steel trap doors and lowering of the water table, many pumps were constantly in danger of being drowned out, as for example on Nov. 22, 1940, when the shaft itself between the 750 level and the 1000 level was flowing 4400 g.p.m.

As shown subsequently, the sinking pumps and shaft ring pumps of not over 125 hp. all had 440-v. motors fed by portable 2-0 tellurium-compound conductor. If one bears in mind that the weight of conductor for transmitting a given watt load with a given power loss is inversely proportional to the square of the voltage, it is quickly seen that for lifting large quantities of water 1000 ft. vertically with 440-v. power, cables of extreme weight would be required. Pressures of 4000 v. and higher are considered too high for rough handling in a wet shaft. Twenty-three hundred volts was standardized upon for all heavy pumps lifting over 1000 g.p.m. 600 ft. vertically or over. The main conductors to underground distributing points were sealed-end lead-covered cables further protected by two layers of spiralled steel upon which was wrapped a heavy layer of

Steel frame of water door used to permit passage of 1-ton car

asphalted hemp cord for protection against corrosion. These cables were lowered by means of a 1-in. auxiliary non-spin hoist cable which was fed down the shaft at 25 ft. intervals, at which points a hammered clove hitch was placed on the electric cable using ¾-in. Manila rope about 4 ft. long. The free end was then clamped to the steel lowering cable using an ordinary wire-rope clamp, the flat side of which pressed against the hemp rope to prevent cutting and loss of strength. When at the final resting place, the power cable was fastened to the shaft timbers every 12 ft. by using two ½x5-in. lag screws to hold a 1/3-circle steel clamp of 2 to 3 in. width depending on the weight and size of the electric conductor.

From feed-out points underground, flexible rubber cables of the best grade, auto-starters and safety switches controlled operative equipment. We found the oil-type switch most satisfactory because open-type magnetic starters and safety switches soon produced oxide of copper on all fresh copper operating surfaces. This oxide offers heavy resistance to passage of heavy currents, thereby producing high heat conditions with subsequent trouble and failure which sometimes resulted in baking of fiber fuse shells. Large installations of motors within themselves produce so much heat that the above conditions are made worse. No large transformers were used underground due to extremely wet conditions, danger from being flooded out and the fact that each additional underground chamber produced large quantities of uncontrolled water, further taxing our diesel plant.

All equipment installed was placed to operate near its full load rating to hold up the power factor. This power factor was further raised by use of capacitors on individual units near operative points. The combined result of these precautions was a general power factor ranging between 94 and 97 percent at great saving in power costs. The only objection to capacitors was their sudden discharge during frequent power outages, which at times puncture motor windings, especially those of the closed-slat type which showed poor voltage protection either due to moisture from high humidity or general deterioration. In this respect we made the mistake of not attaching discharge coils within the capacitors to avoid the condition.

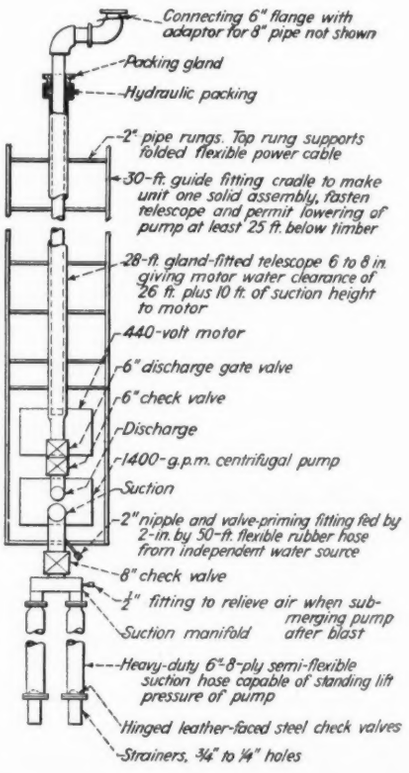
Underground motors were nearly all wound with "open-slat" type coils. As at present constituted, closed-slat winding does not offer the necessary clearance for heavy insulation, and coils are subject to some bruising during placement in the confined space. These mechanical shortages do not adapt themselves to high operating temperatures, a saturated atmosphere, and high voltage surges. The upkeep cost of the few closed-slat windings we operated was extremely high. Whenever submergence of these units took place for even a few hours, total loss of winding was anticipated, whereas, all open-slat units came back with a baking program. In the case of a 2300 v., 100-hp. motor subjected to 48 hours submergence under 400 ft. of water with drying commencing five days after water coverage, it came back without apparent damage. A 440-v. open-slat motor operating our 1400-g.p.m. sinker was submerged 10 times during 28 months of continuous operation with a maximum submergence of 16 ft. and a shut-down period of not over 30 minutes, with no coil burn-outs resulting.

The Pumps. Twenty-one pumps were used. Their characteristics are given in Table II. It will be seen that combinations of 200+ ft. and 400+ ft. heads made it easy to "juggle" the pumps, at the same time permitting very satisfactory combinations as deep as the 1000-ft. level. At many points the shaft was so wet that conventional methods of covering splash-proof motors with metal cages were discarded for 14-oz. water-proof 14×14-ft. canvas tarpaulins sufficiently bolted and tied to permit ventilation of the motor. Under operating conditions this canvas covering permitted perfect insurance from spray water, easy lubrication, inspection and accessibility without affecting the compactness of the unit.

All sinking pumps were vertical electric centrifugals slung below 30-ft. guide-fitting cradles to which were attached 8x6-in. telescopes having 24 ft. of travel. One or two heavy-duty, semi-flexible 8-ft. rubber suctions were attached to pick up water. Fig. 1 shows a diagrammatic sinker pump unit. A 125-lb. pressure, conventional check valve was first flange-bolted to the suction elbow. On this check valve a two-way suction hose manifold was placed. A 2-in. upward-pointing nipple was welded to this manifold for the purpose of injecting, under 160 lb. pressure, priming water with air-lift action independent of the pump's column. Next came the suctions just described, at the lower ends of which were placed two flapper priming check valves designed at our plant to give special compactness. For these check valves suitable strainers were provided. They were profusely drilled with ⅜-in. holes to give an open area five times the suction-hose cross areas. We especially call attention to the independent priming of pumps. Often times a worn system of check valves permit complete drainage of a column during a short shut down. The conventional priming method by passing water around the discharge valves would in our case invoke disaster and flood-outs. Our method of priming with a large volume of water from below the pump is positive and has the advantage of forcing air from the bottom up, thereby eliminating air locks and priming failure.

Four-, 6-, 8-, 10- and 12-in. columns were used, care being taken to keep pipe friction losses down between 2 and 4 percent. The entire weight of the large columns rested on welded feet at the bottom of the string, all being supported by either two steel or

Fig. 1 . . . Diagrammatic wall-plate elevation of 1,400-g.p.m. vertical-type centrifugal sinker installed in Gray Rock shaft


Connecting 6" flange with adaptor for 8" pipe not shown
Packing gland
Hydraulic packing
2" pipe rungs. Top rung supports folded flexible power cable
30-ft. guide fitting cradle to make unit one solid assembly, fasten telescope and permit lowering of pump at least 25 ft. below timber
28-ft. gland-fitted telescope 6 to 8 in. giving motor water clearance of 26 ft. plus 10 ft. of suction height to motor
440-volt motor
6" discharge gate valve
6" check valve
Discharge
1400-g.p.m. centrifugal pump
Suction
2" nipple and valve-priming fitting fed by 2-in. by 50-ft. flexible rubber hose from independent water source
8" check valve
½" fitting to relieve air when submerging pump after blast
Suction manifold
Heavy-duty 6"-8-ply semi-flexible suction hose capable of standing lift pressure of pump
Hinged leather-faced steel check valves
Strainers, ¾" to ¼" holes

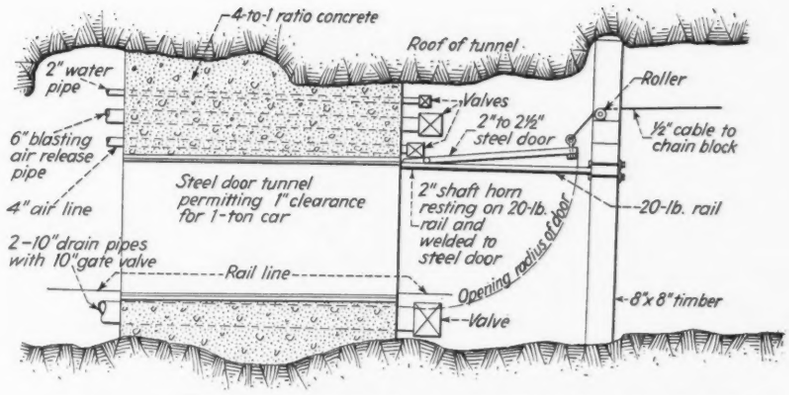

4-to-1 ratio concrete
Roof of tunnel
2" water pipe
Roller
Valves
2" to 2½" steel door
½" cable to chain block
6" blasting air release pipe
4" air line
Steel door tunnel permitting 1" clearance for 1-ton car
2" shaft horn resting on 20-lb. rail and welded to steel door
20-lb. rail
2-10" drain pipes with 10" gate valve
Rail line
Opening radius of door
8"x 8" timber
Valve

Fig. 2 . . . Diagrammatic side elevation of installation set-up for concreted steel water door. A 20-ton jack and spud wrenches were used to close door. Final tightening against ⅛-in. rubber gasket was done with long-end wrenches. Six minutes were allowed for closing door

two wood anchor beams concreted and tied to prevent movement. A safety factor of 10 to 1 was employed here as well as in all major structures endangering human life.

Shaft Water Rings, Bulkheads. Forty-four hundred gallons per minute falling down a shaft make human effort impossible. The force of such weight of falling water nearly pulls men off ladders or anything they may be clinging to. To permit efficient effort, a system of shaft water impounding rings with individual pumps were placed at strategic points as needed. In all, 14 such rings were placed in 800 ft. of shaft section with some rings collecting as much as 1000 g.p.m. In a measure, each ring is then an independent station placed above a tight rock section in the shaft. Structurally, a shaft set is solidly bridged against rock with additional filler wood and wedges to form a base. Upon this base is laid one layer of canvas. Cleats, 2x6x36 in. in size, are then spiked to the shaft posts. Two-by-twelve-inch lagging is then nailed inside these cleats to a desired height. The canvas acts as a seal upon which is further placed 2 ft. of dry mixed, 3-to-1 ratio concrete, the aggregates being fine to prevent wash action. Pouring is done at points of least flow, finally culminating at the point of heavy flow by assistance of corrugated roofing iron for drain-off of overhead water if necessary. This constitutes a cheap but effective system of water control, saves power and makes possible the practical sinking of very wet shafts. It is interesting to note that 4400 g.p.m. flowing uncontrolled for 20 minutes would backfill our shaft 100 ft.

The protection of human life on lower levels from sudden outbreaks of water, prevention of pump station flood-outs and the continuation of lateral development when total mine flow was greater than maximum pump capacities, required installation of steel water doors cased in solid 4-to-1 ratio concrete. As a level was developed in the water zone, it was sealed off by use of the water door shown in Fig. 2. As each level is abandoned, the water is trapped with only slight increase in flow from adjacent shaft rings and the water table is continuously lowered. Our door is capable of safely holding 600 ft. of vertical water pressure with a good margin of safety.

Signalling. This was done to surface by use of a ¼-in. galvanized steel pull cord direct-connected to a mechanical counterbalance clanker bell at the collar of the shaft. The radius of the clanker-bell arm was utilized to transmit signals to the hoist room by means of an electric contactor. The action of the bell is still positive during power outages. Should telephone lines go out, certain signals can still be transmitted to surface and vice versa.

A 2-conductor stranded No. 12 tellurium-compound cable connected phones from surface to underground stations. All main stations mounted two telephones with cut-out switches to eliminate failure of verbal contact during power outages as much as possible. This was vitally necessary since transposing of pumps from main power to diesel power necessarily had to be done with precision and telephone communication.

No. 12 2-conductor stranded tellurium-compound cable, suspended as much as 500 ft. by its own weight, carried 110-v. current for lighting purposes on each station. By installing tumbler switches on each station a system of flash signals was made from this circuit.

Drilling and Blasting. A special technique of electric detonator blasting had to be developed to sink with as much as 1600 g.p.m. in the shaft bottom. The following considerations present themselves with respect to a round of say 6 ft.:

1. Difficult drilling with caving holes from broken ground and heavy water flow under pressure.
2. Impossibility of loading without the use of a dynamite-loaded blasting barrel.
3. Very rapid propagation giving as few as two reports from a 54-hole round with terrific destructive force on timber and equipment.
4. Heavy use of explosive making work impossible due to excess noxious fumes, inasmuch as shaft crew had to

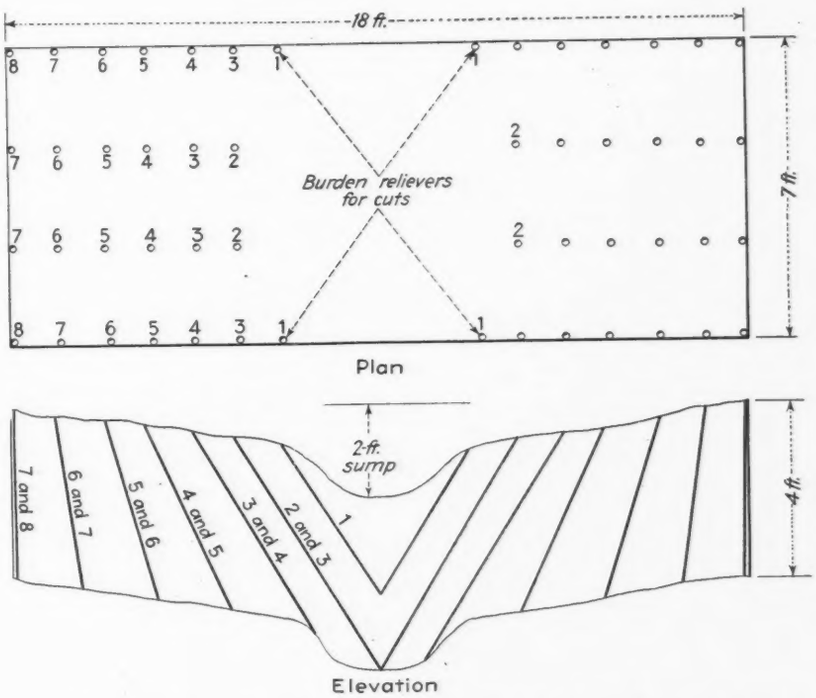


Fig. 3 . . . Drill round used in sinking to give 3½-ft. breakage. The order of firing the detonators is shown

return to hook up pumps within 4 minutes after last report. This in spite of fume absorption by water and use of forced ventilation.

5. Heavy detonations under deep water produce a heavy water hammer with collapse of the detonator giving water contact of fulminate and misfires.

6. Long time interval required to drill the round.

7. Necessity of using 60 percent gelatin dynamite.

If we take a 3 ft. 6 in. round which was ideal under our conditions, the following considerations are presented:

1. Less difficulty from caving ground and less water picked up per round.

2. Less difficulty in loading with less blasting-barrel loading.

3. Great reduction in propagation with reduced concussion from less powder per hole.

4. Reduction in amount of fumes.

5. Elimination of water hammer.

6. Drilling time reduced to one third with few holes lost from caving.

7. Reduced blasting depth permits use of 40-percent gelatin dynamite.

For fast rigging up, drilling out and rigging out, a 4-jackhammer jumbo mounted on trucks was lowered and raised in the shaft by 4-point chain suspension. This was rigged with water and air manifolds, mounting individual cut-off valves and a 13-ft. hose for each jackhammer. A 50-ft., $\frac{3}{4}$-in., 180-lb.-pressure, spud-fitted rubber hose fed water to its respective manifold while a 50-ft., 2-in., 180-lb.-pressure flexible spud-fitted rubber hose fed the air manifold.

The compactness of the unit permits a single fast handling of drilling equipment, promotes safety by eliminating the cumbersome use of eight 50-ft. hoses hanging down the shaft. Machines are kept clean, thereby reducing costly breakdowns in the bottom and materially increasing their life.

Fifty-four electric detonators with 12-ft. lead wires were blasted in two equal parallel groups from a main No. 12 stranded 2-conductor, water-proof, tellurium-compound cable, energized with 440 v. and fused at the feeder switch to 60 amp.

From the shaft-round diagram in Fig. 3 it will be seen that maintenance of a cradle-like shaft bottom is indispensable for wet sinking because of the following reasons:

1. Even with 1,600 g.p.m. flowing, 80 percent of the rock bottom is exposed or not submerged.

2. It permits easier, quicker and more thorough cleaning of the bottom.

3. Rapid drilling and loading of holes is possible.

4. Prevention of men from working under water is a great protection against missed holes, which even the most skilled miners will overlook under submerged conditions. I must stress this point particularly.

Diamond Drilling. A total length of 2715 ft. of diamond-drill hole was put in below the water table behind cut-off valves to isolate any water picked up. Minimum and maximum water pressures were 100 lb. per square inch and 200 lb. per square inch respectively. With each hole completed and casing removed, water flowed around 500 g.p.m. through a 3-in. collar standpipe fitted with a cut-off valve.

The practice was actually to drill two holes in one, that is, the drill rods were run down until heavy water flow was encountered, then the casing was rotated as a set of drill rods with a thin-faced bort-set bit screwed on its end. This casing bit permits clearance for the drill-rod bit and, when worn out, the casing string must be pulled for replacement of the bit. Occasionally some reaming is required.

Due to caving, standard reaming methods and casing placement proved extremely costly with high bort loss from the gouging out of the diamonds. Then too, the friable non-coring nature of the vein quartz encountered did not permit much open hole because value-carrying hole sludges washed away in the fissures. Thus the main objective of the drill hole is lost. It will be seen that the double drilling system gives some control of assay values because water can be continuously cut off. Diamond drilling under such handicaps with periodic additional overhead of power requirements of 1,750,000 kw. per month gave overall costs of $20 per foot. This merely shows the complexity which overshadows all phases of work controlled by such heavy flows.

Safety. Our experience shows clearly that good equipment and skilled competent supervision are the main levers of safety.

From capable supervisory officers spring most of the safe engineering, safety sentiments, control of accident producing man-made traps, elimination of carelessness and training for careful workmanship.

Inspection of cables was always done in the crew's presence and weights of all loads were known, with a safety factor of 10 to 1 employed.

Conclusions. This hazardous piece of work was accomplished with few accidents, thanks to fine ability and co-operation of competent workmen plus human teamwork. The handling of thousands of gallons of water per minute with pumps with few reserves and serious danger of power outage is cause for much operative mental strain to management. Much foresight is required to anticipate breakdowns for prevention of flood-outs.

The advent of the guaranteed mercury-sealed Byron Jackson submersible pump, a year ago, should revolutionize wet shaft sinking. The adaptability of this pump to submergence up to 500 ft. eliminates the installation of standby emergency diesel or steam power. It makes an ideal ring pump placed in a concrete chamber alongside the shaft. All starting switches would be at the surface.

For gallonages of over 5000 g.p.m. a spare shaft compartment properly sealed against heavy falling water from rings during power outages, is necessary. Without this precaution, danger of drowning exists for workmen. When such an amount of water tumbles down a shaft, it splashes and spreads rapidly through a short vertical distance. The impact is terrific and even electric lights give no visibility. Open lights are useless.

This work was engineered and executed by Fred Searls, Jr., of New York, John Becker, of Nevada City, Calif., and myself.

Table II. Characteristics of the Pumps Used

Pump No.	No.	Make	Hp.	Volts	R.P.M.	Head	G.P.M.	Type
1	1	Byron Jackson	100	440	1750	400	600	Vertical sinker
2	1	Byron Jackson	125	440	1750	450	600	Vertical sinker
3	1	Byron Jackson	75	440	1750	200	1400	Vertical sinker
5	2	Byron Jackson	3" sponge pumps (emergency auxiliaries)					
7	2	Byron Jackson	50	440	3550	400	360	Horizontal
9	2	Byron Jackson	100	2300	1750	600	360	Horizontal
10	1	Byron Jackson	125	440	3550	525	600	Horizontal
11	1	Byron Jackson	150	440	1750	425	1000	Horizontal
12	1	Byron Jackson	30	440	1750	250	300	Turbine
13	1	Byron Jackson	400	2300	1180	450	2600	Deep well turbine
14	1	Byron Jackson	400	2300	1750	450	2600	Submersible turbine
15	1	Goulds	125	440	1750	650	500	Turbine
17	2	Cameron	400	2300	1200	735	1600	Turbine
18	1	Cameron	300	2300	1750	635	1000	Turbine
19	1	Cameron	14x7x13 No. 10B air sinker (emergency submersible)					
20	1	Worthington	60	2300	690	800	209	Triplex plunger
21	1	Worthington	60	2300	690	800	250	Triplex plunger

▼ ▼ ▼

Native Copper as Cement in Placer

NATIVE COPPER occurs as a cement placer material within a restricted area near Jefferson City, Mont., according to J. D. Forrester, in *Economic Geology*, March-April, 1942. The deposit is in a shallow canyon near the head of major Prickly Pear Creek drainage system where an intimate association of peat muck, bog-iron oxide, and alluvial gravels gives a unique set of natural reducing conditions that attend the resulting deposition of secondary copper from percolating subsurface waters. The copper is derived by oxidation of narrow epigenetic veins that occur upstream in rocks of the Boulder batholith. It is carried downward as copper sulphate in solution until it reaches the reducing environment.

Cyaniding Flotation Concentrates At the Batong-Buhay Gold Mine

Certain difficulties make the practice described of interest

R. F. Brown
Mill Superintendent
Batong-Buhay Gold Mines, Inc.
Lubuagan, Kalinga, Luzon, P. I.

▶ ONCE AGAIN *E.&M.J. presents an article on the operations of a mining company in the Philippines. The manuscript was received shortly before Pearl Harbor, and in consequence no subsequent correspondence with the author has been possible. Although nothing is known as to the present status of the company and its operations, nor of Mr. Brown, the latter's contribution should be interesting to many of the Journal's readers.*

SITUATED on the northern end of Luzon, in the Philippines, the Batong-Buhay Gold Mine has presented its operators, the International Engineering Corporation, with some interesting metallurgical problems in the economical treatment and marketing of the precious metals produced. The property is 250 km. north of Baguio, over the mountain trail by way of Bontoc and Lubuagan, following which route a new road 32 km. long was built into the mine. There is considerable rain throughout the year, but the road is passable most of the time. Elevation is approximately 3500 ft.

Power is supplied by Atlas Polar diesel engines direct-connected to Asea generators. A generous supply of good water is delivered by gravity from a nearby stream for commercial and domestic use.

Rugged topography permits the exploitation of the mine by adits, over a vertical distance of 1200 ft. Shaft sinking is in progress on the lowest level. The veins are narrow and high-grade. Stoping by conventional filled stull sets is practiced. Softness of the vein material makes possible the use of I.R. 75 pneumatic diggers to break the ore at a considerable saving in dynamite.

Pyrite is the most common mineral; chalcopyrite next, with bornite, covellite, sphalerite, and galena rare. Sugar quartz is the principal gangue. Sulphide minerals, amounting to nearly 3 percent of the ore by weight, are finely disseminated. Twenty to 30 percent of the gold is intimately associated with the sulphides, and the remainder is finely disseminated in the quartz mass. The ore has been partially oxidized on the upper levels. A sample partially analyzed gave the following results: copper 0.197 percent, lead 0.14, zinc 0.22, iron 2.97, aluminum 1.0, sodium 0.4, magnesium 0.1 and calcium 0.1.

Ore is transferred by ore pass to the present drainage level of the mine, and is delivered to the coarse ore bin by a Mancha battery locomotive pulling ten 20-cu.-ft. side-dump cars.

A 150-ton mill was placed into operation on Oct. 1, 1940. In the following paragraphs is given an outline of the flowsheet and the practice followed in an effort to produce as much bullion on the property as possible. A gold recovery of 90 percent is maintained.

Coarse ore is fed by a Jeffrey vibrating apron feeder to a Traylor jaw crusher for primary breaking. Washing is done by a Denver trommel washer with $\frac{5}{8}$-in. screens, the oversize going to a Symons cone crusher, and then to a 250-ton fine-ore bin. Trommel undersize is re-sized on a Jeffrey vibrating screen having $\frac{1}{4}$-in. openings, the oversize bypassing the secondary crusher to the fine-ore bin. Undersize of the vibrating screen is passed over a 18x18-in. Pan-American pulsator jig, and is fed to the primary classifier which is in closed circuit with a No. 56 Marcy grate mill charged with 4-in. steel balls. A second jig, also a Pan-American pulsator, is at the discharge of the Marcy mill. Additional feed is drawn from the fine-ore bin as may be required by Hardinge constant-weight feeders.

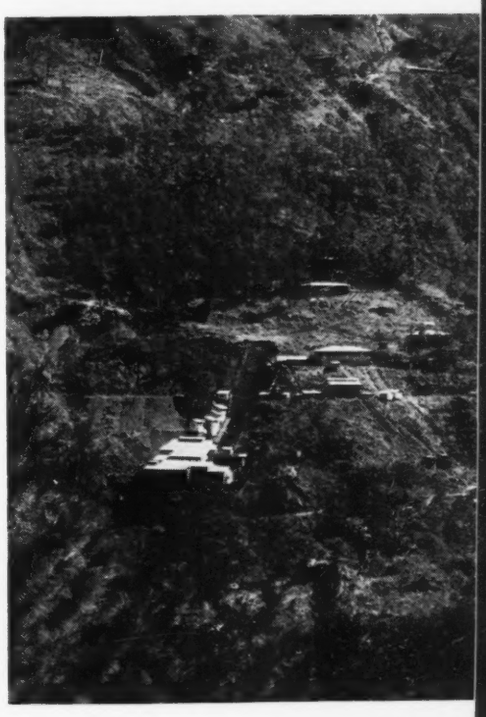
The overflow of the primary classifier, which is of the rake type, is fed to a 9-ft. Dorr bowl classifier, where sizing is effected. The latter classifier is in closed circuit with a 5x6-ft. Allis-Chalmers granulator, using 2-in. steel balls as grinding media.

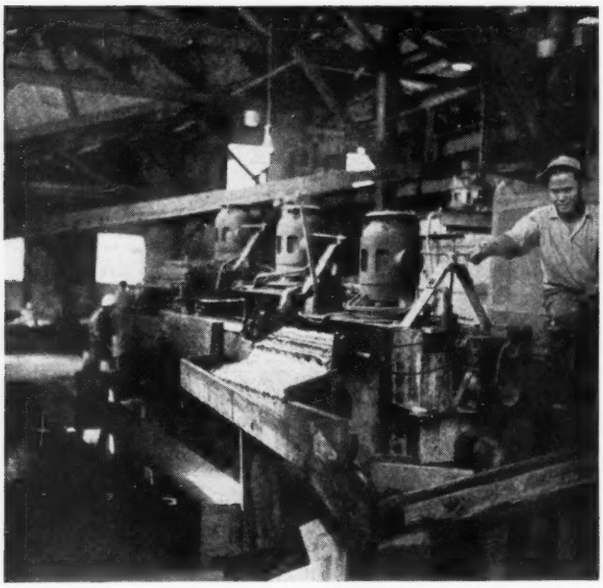
A Denver 12x16-in. mechanical jig at the discharge of the No. 2 mill completes the jigging operation. The hutch discharge is continuous, all product going to a No. 12 Wilfley table. The reject is returned to the bowl classifier and the product caught in cans for re-tabling.

The bowl classifier overflow, 85 percent minus 200 mesh, goes to two distributing boxes, one feeding two and the other four 3x8-ft. corduroy blanket tables set at a slope of $1\frac{1}{8}$-in. per foot. Five tables are in the circuit at all times, while one is down for washing. This is a continuous operation, requiring approximately 30 minutes to wash all six blankets. Gold-saving corduroy of the conventional type is used. Its life is short, due to the presence of ferrous salts making the pulp extremely acid, as indicated by the pH of the bowl classifier, which is 5.4 normally. The blanket product is stored in the washing sumps and is re-tabled on a No. 12 Wilfley; the tailing of this operation joins the blanket tail, and is pumped to a 40-ft. Dorr balanced tray thickener. The overflow goes to waste and the underflow to flotation at 20 percent solids.

Bulk flotation is accomplished in ten No. 18 Denver cells, followed by three 36-in. Fagergren cells. The first five Denver cells are used as cleaners, with the feed entering No. 2. The other five are used as roughers, and the three Fagergrens as scavengers. All product

The Batong-Buhay camp in Kalinga, Mountain Province, Island of Luzon. It is about 250 km. north of Baguio and 3,500 ft. above the sea





Fagergren cells in the selective flotation circuit

A closer view of the Batong-Buhay mill

is fed into the first Denver cell. Tails go to waste assaying 0.03 oz. gold.

Reagents are: Aerofloat No. 208, 0.02 lb.; No. 301, 0.45 lb.; sodium silicate, as water glass, 1.5 lb. per ton; 2 parts pine oil and 1 part Texaco viscous oil No. 16 mixed and used as required; and Barrett oil No. 4, 0.02 lb. per ton. The pH of the flotation tails is 6.0.

The product made on the first five Denver cells is sent to a recleaner circuit consisting of a secondary conditioning tank and three 36-in. Fagergren cells. Lime is the only reagent added; a pH of 9.5 being maintained. The first cell is primarily for copper separation, but due to physical changes in the ore, namely, less oxidation and more sulphides, it became impossible to make a satisfactory copper separation. The circuit was therefore modified, and the following practice has proven satisfactory:

Lime is fed to the secondary conditioner, and the concentrate re-floated to make a clean mineral separation. The tailings, consisting chiefly of deleterious slimes, are returned to the bulk flotation circuit via the No. 1 cell with the rougher product. The concentrate produced in the recleaner circuit goes to cyanidation.

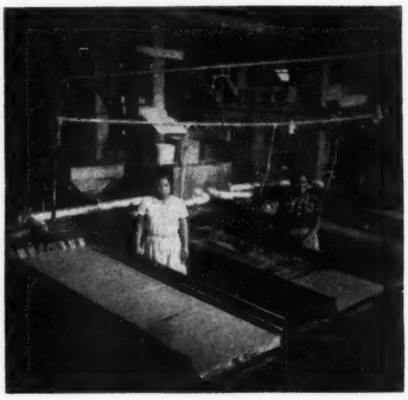
The cyanide circuit consists of a 12x7-ft. dewatering thickener; an American four-disc filter separated into one-disc and three-disc compartments, the former being used for filtering the copper or shipping concentrate, and the latter for the cyanide product; six 7x10-ft. Devereux agitators in series; one 12x24-ft. Dorr multiple-tray countercurrent washing thickener; one 14x16-ft. Denver agitator; one 7x12-ft. washing thickener; and a 6x5-ft. Oliver continuous filter. The pulp flows in the order in which the equipment is listed. A 200-ton Merrill-Crowe bag-type precipitation unit and solution storage tanks complete the plant.

Originally, the re-cleaner circuit was installed as a selective circuit for the removal of copper and enough gold and silver to allow the treatment of the concentrate tailing in the cyanide plant. But due to the poor selectivity obtained and the slime content of the tailing, it was obvious that a radical change was in prospect.

The distance from our market which is the Philippine smelter at Mambulao, in Camarines Norte, Luzon, and the cost of drying and sacking made the cost per ton of concentrate shipped high. The cost of providing even a small roasting plant, and its operation together with the unsettled world conditions and the probability of increasing the milling capacity presented quite a problem.

Fine grinding necessary and the amount of natural slimes in the ore limited the capacity of the cyanide plant. After removing all the slimes possible, and treating the same tonnage of concentrate, cyanide consumption fell 50 percent. Settling rates increased enough to allow the treatment of all the concentrate—the only bottleneck being in precipitation plant. However, sufficient solution storage was available to prove plant results, and until more precipitation capacity is available we are shipping 13.17 percent of the concentrate produced, and treating 86.83 percent in the cyanide plant. Total concentrate amounted to 6.264 percent by weight of the tonnage milled. Cyanide consumption is 88.20 lbs. per ton of concentrate treated.

Six corduroy tables are used to recover gold from the bowl-classifier overflow



Data for two consecutive months prior to the change of practice indicate that 61.69 percent of the total output was shipping concentrate and only 38.31 percent concentrates for cyanidation. Cyanide consumption was 61.33 lb. per ton of concentrate treated, and total concentrate amounted 5.24 percent by weight of the total tonnage milled. Cyanide strength was 3 lb. of KCN in both cases cited.

A precipitation of 368.3 lb. of copper per month is indicated, running 200 tons of solution per day. Acid treatment of the precipitate was anticipated until I read the article written by E. C. Bitzer which appeared in the June, 1941 issue of the *Engineering and Mining Journal*, entitled "Refining a Low-Grade High-Copper Gold Precipitate." In this article the point of using pyrite as a flux in the precipitate and further reduction by sulphur was brought out.

We found that our precipitate would make a matte carrying 75 percent copper and a fineness of 4.0 for gold (so states the author—Editor) by adding 4.0 percent sulphur to the flux. The flux is as follows: soda 30 percent, borax 35, silica 20, fluorspar 2 and sulphur 4.0 by dry weight of precipitate. This produced a bullion but-

ton assaying 422.35 gold, 131.0 silver and 446.65 copper per 1000.

The same product, fluxed as above but without using sulphur, gave a bullion fineness of 153.34 gold, 41.18 silver, and 805.48 copper. No matte was formed.

In fluxing the precipitate the usual procedure is followed—drying, fluxing and passing all material through a ¼-in. screen. No trouble was experienced in melting when the sulphur was kept below 8 percent. When it was in excess of this amount the melt became violent, and at 15 percent the fineness of the button was 759.40 gold, 47.95 silver, and 192.65 copper. However, the matte held 40 percent of the gold. This was easily recovered by fluxing the matte with cyanide and broken slag, and remelting. This gave a secondary matte with a fineness of 4.0 gold, 71.20 silver, and 55 percent copper (as expressed by the author—Editor). This compares favorably with the matte produced using 4 percent sulphur.

The practice just described has a decided advantage over acid treatment in many respects, the principal ones being that there is less handling of precipitate, the danger of handling acids is avoided, the cost of installing and maintaining an acid-treating plant is eliminated, and time is saved.

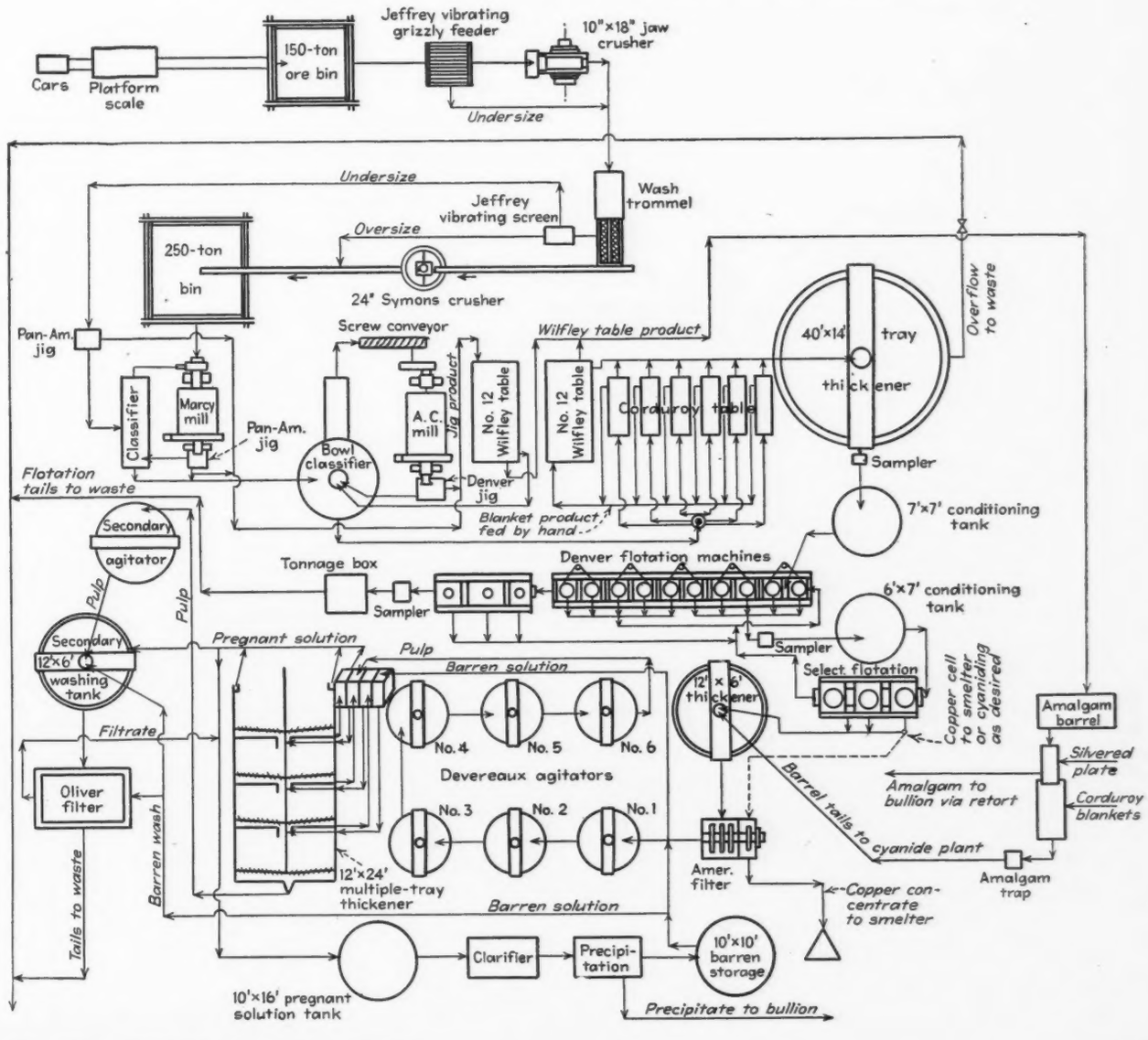
Amalgamation accounts for 57.5 percent of our gold production and is an important phase of the flowsheet.

The gold and the sulphide are very finely disseminated in the ore; a grind of 90 percent minus-200-mesh being recommended to liberate them. Seventy percent of the gold is free, the remainder being associated with the sulphides. The gold particles will all pass a 100-mesh Tyler screen, 90 percent will pass 150 mesh and only 30 percent is held on 200 mesh. These tests were made on the Wilfley table product, that is, the amalgamation barrel feed process, at various times.

Product recovered on the blankets and jigs amounts to about 1 ton in 24 hours. This is retabled on a No. 12 Wilfley. The tails go to flotation via the 40 ft. dewatering thickener, and the product averaging 125 kg. is charged daily with 3 percent lime, 3 percent sal ammoniac by weight of concentrate, and mercury to make an amalgam of the consistency of soft butter. Eight cubic centimeters of mercury is added per kilogram of wet concentrate, with the barrel head assays averaging 350 oz. gold per ton, and 4-in. steel balls as grinding media. The barrel is then rotated for 12 hours.

Barrel clean-up is as follows: after the allotted grinding time has elapsed, the discharge bung is removed, and the slime and water are allowed to run out slowly over an 18x36-in. silvered amalgam plate. After draining, the charging hole is opened and the remaining sand and slime are washed out

Flowsheet of Batong-Bubay's 150-ton mill. Amalgamation accounts for more than half of the gold recovered



into an iron container. The amalgam and heavy foreign particles are caught in the container and if liquid quicksilver should be present in excess, it is poured off and added to the amalgam after cleaning. The amalgam, which is usually soft and easily workable, is spread out on the plate and washed under a water base. This process cleans out most of the iron particles and foreign matter. The amalgam is then squeezed through two thicknesses of heavy muslin, and is ready for retorting. Amalgam varies from 14.5 to 29.6 percent bullion to mercury, depending on the size of the gold particles. All squeezing is done by hand, as mechanical squeezing tends to make the amalgam break up due to the small particle size.

Finished amalgam is charged into a pot-type retort having a maximum charge capacity of 30 kg. Four hours are required to prepare the retort, using wood as fuel. When prepared, the inside of the pot is painted with bone ash mixed into a thin paste with water, and is dried before retorting. This prevents the sponge from adhering to the retort, and no foreign matter is given off to plug the condenser, as often happens when paper is used.

The sponge runs from 650 to 750 in fineness and the percent of gold in the amalgam 11.5 to 15.0 which is very low. But when the extremely small particle-size of the gold is considered, the amount of mercury necessary to wet all pieces is naturally very great. An example of this can readily be seen in the comparison of 1 kg. of fairly coarse sand passing through a 35-mesh plus-100-mesh screen wet with water, and 1 kg. of minus-200-mesh material wet with water. The fine material will absorb much more water than the coarse material.

The gold-to-amalgam ratio is much lower than at any other property known to me. It was particularly noticeable to me at the first clean-up, for I had been used to amalgam running 43 to 55 percent bullion with a fineness of 750.

After retorting, the sponge is melted into bullion with the precipitate buttons. Melting is done in a DFC tilting-type pot furnace using a No. 150 graphite crucible. The flux contains 5 percent borax, 5 soda as soda ash, 0.3 fluorspar, and 5 percent slag. The slag is selected from the bottom and sides of the cast to replace as much values as possible. The rest of it is returned to the ball mills after screening. Slag assays 3 to 5 oz. gold per ton.

After the melting is complete, drossing is accomplished by adding silica, and skimming until all the matte and slag have been removed. The furnace is re-fired and the metal brought up to pouring heat, then transferred into a No. 30 graphite crucible, and poured into the bar molds. The average weight of the bars is 575 oz. troy and they assay plus 600.0 fineness gold and plus 130.0 fineness silver. Sampling of the bars is done by drilling alternate corners. Results check closely with the mint returns.

In conclusion, I wish to express my gratitude to James R. Needham, general superintendent, for his good advice and encouragement in preparing this article.

Idaho Mine Increases Strategic Mineral Output

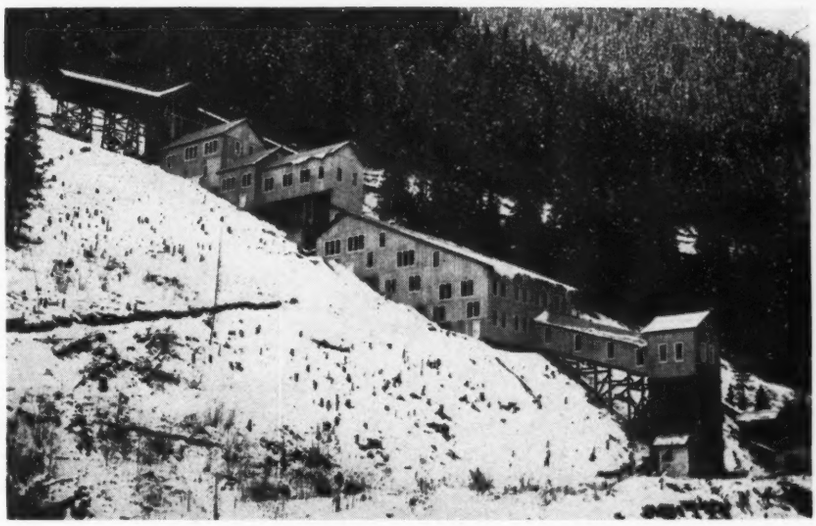
A Coeur d'Alene company becomes an important producer of copper-antimony-silver ore

Robert D. Baily
Chief Engineer
Coeur d'Alene Mines Corp.
Kellogg, Idaho

OF SPECIAL INTEREST because it is an important new development in the long established Coeur d'Alene mining district, the Coeur d'Alene Mines is becoming one of the large producers of copper-antimony-silver ore of North America. The original location was made on the Mineral Point vein in 1885 and ore valued at $200,000 is reported to have been taken from the upper workings during the period prior to 1900. The vein was cut off on the west end at depth by the Mineral Point fault, and in the intervening years up to 1937, much work was done in an attempt to find its downward extension. These efforts opened a large vein west of the fault on the main tunnel level, where it was drifted on for 600 ft., without finding the lower extension of the Mineral Point vein. This western vein was strong and well-defined, but was not commercial, having only traces of silver and copper in a heavy siderite gangue. In view of the massive siderite structure, it was called the Siderite vein, but because of its low grade 500 ft. below the surface, it was of little account in hunting the lower extension of the productive vein east of it.

As to the geology, veins on the property cut the steeply dipping beds at about 40 deg. The vein fissure was filled with siderite with a later mineralization of quartz and pyrite and a still later mineralization of chalcopyrite and argentiferous tetrahedrite. The wall rock is a quartzite of the Belt series, locally called St. Regis, apparently bordering the Revett quartzite formation, which some of the beds greatly resemble. A study of the surrounding district has proved the vein to be located in the lower limb of a large overturned anticline, the beds dipping in a reverse direction 70 to 90 deg. The present known limits of the Siderite vein are the Polaris fault on the west, a major fault of the district, and the Mineral Point fault on the east. The two faults are about parallel and 800 ft. apart on the strike of the vein. As the dip of the faults is the same, the vein continues at the same length in its downward extension. On the west the vein becomes small and grades up to the Polaris fault, but is cut off sharply on the east against the Mineral Point fault. Exploration on the 1200 level east of the Mineral Point fault discloses a wide faulted zone, but this work is not at all conclusive, being done only when fill rock was needed below the level. All of the effort to the present has been toward developing the known orebody. There is, however, a good possibility that the vein is located east of the Mineral Point fault, because the original productive outcrop was east of the fault on the surface.

In 1937 the company started sinking, and collared a vertical shaft in the hanging wall of the Siderite vein,



Mill of Coeur d'Alene Mines Corp., showing part of track from mine portal

which it cut 300 ft. down. No crosscutting was done until the 1000-ft. level was reached. In the summer of 1938 the vein was cut 1000 ft. below the tunnel level, 1500 ft. vertically below the surface. Here it was heavily mineralized with tetrahedrite and was of commercial grade. All of the work done up to the time of the discovery of commercial ore was made possible by assessing the stockholders, but as soon as stoping was actually begun on the 1000 level, the mine financed its own development and prospecting program. During the first two years of production, the ore was treated in a local custom mill; but when sufficient tonnage was blocked out to insure steady production, a 300-ton mill was built. The mill since then has been enlarged to a daily capacity of 600 tons. The production of the mine at the time of writing is about 400 tons a day and will increase as new levels are opened up for mining.

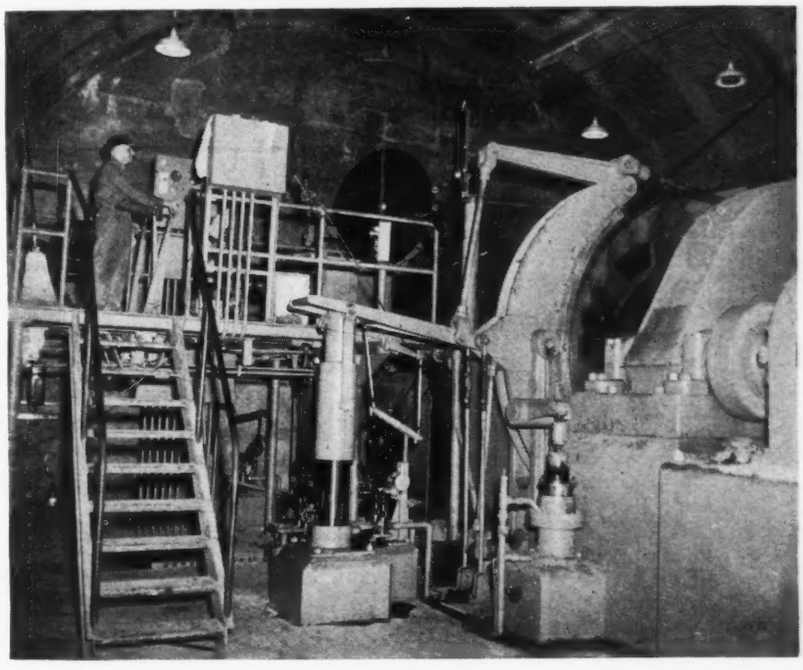
The orebody is being developed by drifting and raising and continuing the sinking to lower levels and crosscutting to the vein at 200 ft. intervals. By raising about the 1000-ft. level, an 800 and a 600 level have been opened up. Sinking below the 1000 level has permitted opening levels at the 1200, 1400, 1600, and 1800 ft. points. Future development will include further sinking to open lower levels in order to maintain a constant ore reserve.

As soon as a new level is opened by drifting, three main raises are driven to the level above. These are evenly spaced, the end raises being about 75 ft. in from the ends of the orebody and the middle one centered between the others. This makes four distinct blocks of ore, two of them 75 ft. long at the ends of the orebody, and two 150-ft. blocks between. The main development raises are three-cap four compartments containing a manway, a timber slide, and a chute on either side to the level.

The mining method used is characterized by a horizontal cut for the full length of the stope, timbering with a cap and post, and filling with waste rock to within two sets of the back. Vertical holes are drilled with stopers and the ore is blasted against the muck pile resting on timbers. The width of the vein varies between 3 and 12 ft., a cap is cut to fit the ground and to carry a floor at right angles to the dip. The cap is wedged in with head boards to cushion the swelling ground, and is posted to the set below by a hanging wall post and other posts where necessary. The set under the floor on which the muck pile is resting is left open and a slide board is provided on the muck floor which can be removed to let the broken ore fall through chutes improvised in the open set below. The ore is carried by these chutes to the main ore chutes permanently built up as the stope progresses. The large pieces of waste are sorted out and put in the waste fill below. The main chutes with their accompanying manways are constructed in every fifth set, or at 25 ft. intervals. Waste rock is brought in from development and prospecting work on the levels above, and dropped down to the stoping area through the main development raises. The fill is kept up to the floor below the muck floor. Double-drum air hoists and scrapers are used in some stopes for taking the fill rock from the main raises to the center of the stopes.

Started as a prospect shaft, the main vertical shaft was made small to keep expenses to a minimum. It has two and a half compartments, the full compartments being 4x4 ft. in the clear, and the half compartment, 27 in. by 4 ft. The compartments are adequate for handling almost any tonnage and the shorter side is long enough for pipes and a ladder way. There is some difficulty in the small shaft in handling machinery, timber, and in lowering and hoisting the crew. The skips hold a 4-ton pay load and, running in counter-balance, can hoist 8 tons in five minutes, on the average. The cages will accommodate 12 men and, with the center deck removed, will handle 16 ft. timber. Level stations are of standard size and shape, being driven back 25 to 30 ft. from the shaft for the width of the two and a half compartments. The roof of the station is arched so that in most cases the only timber necessary is a station set at the shaft. The back is 12 to 15 ft. at the shaft and tapers to 10 ft. high over the pocket. The pockets are rock raises, started off the shaft

Underground hoist room with new hoist installed



50 ft. below the station floor, driven up at 35 deg. until they are 25 ft. away from the shaft, and then raised vertically to the station. The only timber necessary in them is the chute set at the shaft and a row of stulls up the middle to separate ore from waste.

A year ago the single-drum hoist used for sinking the first 1000 ft. became inadequate for handling the expanding development and mining program. The problem was to install a double-drum hoist capable not only of handling the present output but also a larger future production and from a greater depth. The hoist installed was 500 hp. with two 9-ft. drums each capable of hoisting a 4-ton pay load, in counterbalance or individually, 4000 ft. vertically at the rate of 1500 ft. a minute. The hoist has Lilly control for safety, is powered by alternating current, and equipped with electric-dynamic braking.

The main station is approximately 2000 ft. in from the portal on the tunnel level and two 8 ft. head sheaves were installed. A crosscut was driven into one wall of the shaft on the main tunnel level and the hoist room cut out of the rock at the end of the crosscut. The room is 45 ft. long, 40 ft. wide, and 25 ft. high. Its roof, or back, is semi-circular, giving the room the appearance of a segment of a large tunnel 40 ft. wide and 25 ft. high. The roof is lined with 12 in. I-beams prefabricated into an arc of 21-ft. radius. The beams were brought into the mine in three sections and welded into place in 5 ft. sets throughout the 45 ft. of length. The sets are sheeted with $\frac{1}{8}$-in. corrugated steel spot-welded lightly to the ground side of the curved sets. The space between the ground and the steel structure is filled with finely broken rock. The I-beams and the corrugated sheeting are of Corten steel giving the structure more strength and resistance to corrosion. The ends of the room are concreted, with reinforcing steel tied to the rock by drilling holes and grouting the steel into the holes. The floor is a concrete slab laid down on broken fill rock. The room is kept dry by sealing the overhead steel structure so that the water runs down the sides and is carried off by pipes laid under the floor slab. A timbered two-compartment cable raise was driven from the hoist room to the top of the shaft. A rock pocket for ore and waste was raised from the tunnel level on the opposite side of the shaft to a point 75 ft. above the collar. The pocket is divided by timber into an ore and waste chute, and a door installed so that one compartment of the shaft can handle both ore and waste. For main tunnel haulage, a 4-ton trolley locomotive pulls eight to ten $1\frac{1}{2}$-ton cars.

At the portal of the mine the surface plant has been improved to facilitate handling a larger tonnage. New shop buildings have been added, the change house has been enlarged to accommodate more men, the compressor house remodeled, a new compressor added, and a power saw installed in the timber yard. Yard room was at a premium at the portal with the creek taking up over a third of the available space, so 5-ft. corrugated culvert pipe was laid down in the creek bed and covered with mine waste rock to level off the yard. The surface buildings are heated from a central steam plant situated down the valley below the level of the yard to provide a gravity return system to the plant.

The mill is 1800 ft. down the valley from the mine portal, the coarse ore bin being on the same level as the latter and connected with it by trolley locomotive haulage. The bin has a capacity of 500 tons, and it feeds a 10x20 in. Blake type crusher set at a 2-in. opening and discharging on a $1\frac{1}{2}$-in. screen. Oversize feeds directly through a 36-in. cone crusher set at $\frac{3}{4}$-in. opening. The cone discharge and the screen undersize pass over a second screen with a $\frac{5}{8}$-in. square opening. The undersize from the latter goes directly to a 500-ton fine-ore bin, and the oversize is returned to the cone crusher. The crushing plant operates smoothly and efficiently at a capacity of 40 to 50 tons an hour. A cone-shaped dust collecter is installed to minimize dust in the crushing section.

Ore from the fine-ore bin is fed to the 8x6 ft. ball mill in closed circuit with a 6 ft. drag classifier. The classifier overflow goes directly to the first flotation rougher which is the second cell of a 12-cell battery of M.S. type machines. The rougher concentrate from the last 11 cells is returned by gravity to the first, or cleaner, cell. Concentrate from this cell goes to a settling tank; the tails are returned to the rougher cells. Rougher tails go as waste to the creek.

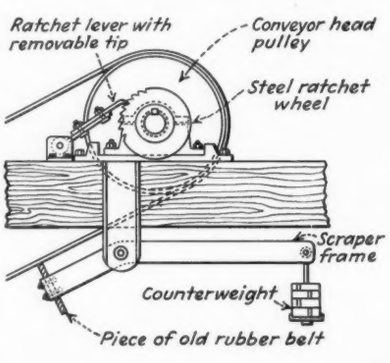
The thickened concentrates are elevated to a drum filter and dried preparatory to storage in the concentrate bin and shipment to the smelter. Cresylic acid, Aerofloat No. 31, and soda ash are added to the ball mill. Aerofloat No. 208 is added to the first rougher cell and a smaller amount to the sixth rougher cell. The concentrate is shipped by truck to the Bunker Hill smelter, eight miles away by paved highway. The present capacity of the mill is rated at 300 tons a day, but an additional ball mill, classifier, and bank of flotation cells are being installed to bring the capacity up to 600 tons.

A modernly equipped assay office is located near the mill site. An electric assay furnace is provided for silver assays, and there are facilities for copper, antimony, lead, and zinc assays.

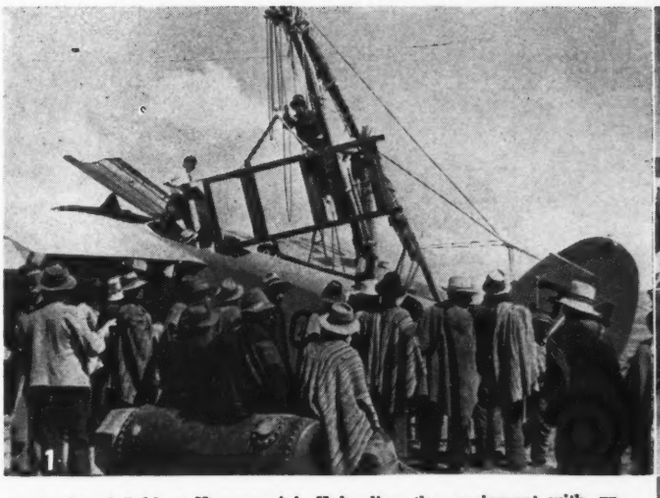
Personnel directly connected with the Coeur d' Alene Mines organization in administrative capacity include: Dr. H. C. Mowery, president; Dan Leary, vice president and manager; Less Randall, secretary and treasurer; Robert Baily, chief engineer; and James Doyle, mine superintendent. The Coeur d'Alene Mines Corporation, being a new organization, was proud to announce in 1941 its first return to the stockholders for their investment, and the company expects to be a dividend payer for a good many years to come.

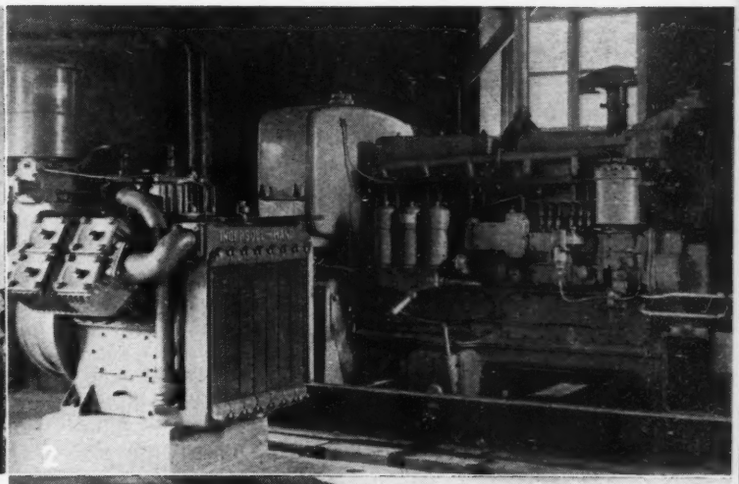
A Belt Scraper Made From Scrap

AT THE MILL of West Coast Mines, Inc., near Winnemucca, Nev., wet ore is transported occasionally on the incline conveyor belt serving between the ore bin on the headframe and the coarse-ore storage bin at the head of the crushing plant, and complications such as muddy material sticking to the belt, making smooth operations impossible, are experienced at times. The only effective method by which this difficulty could be overcome was by means of the simple scraper arrangement shown in the sketch. Essentially it consists of a pivotal frame made from strap iron, two channel-iron bearing columns, a counterweight, and the scraper element proper—an old piece of rubber belt. The device is installed below the head pulley of the conveyor as shown in the accompanying drawing, and all parts used in making it were made from scrap.



The rachet wheel shown is useful in preventing the loaded conveyor from rolling back in the case of sudden power failure. It is simple in design, positive in action, and comprises a toothed wheel keyed to the head pulley shaft, and a ratchet lever with a removable tip operating between two angle-iron supports. In case of power failure the ratchet lever tip falls into the tooth or notch in the steel wheel and instantly locks the head pulley.





1: At the airfield at Huanucoviej. Unloading the equipment with an home-made crane. 2: The power unit, a Caterpillar diesel D13000, and the I-R compressor when finally installed. 3 & 4: How some rough uphill stretches were negotiated by sheer man-power. 5: One of the crude carts used in moving the equipment

Transport Difficulties in Peru

Panaminas Inc.'s new equipment weighed only 4 tons, but it took 85 natives to move it in the manner shown over the rough mountain route

BOTH THE NEWEST and the oldest known methods of transportation were employed recently to supply the Panaminas, Inc., mercury mine in Peru with needed equipment, when it decided to install a diesel-driven power unit and a compressor. The transportation problem was difficult. It was decided to fly the equipment from Lima to a landing field at Huanucoviej, 11,500 ft. above sea level. From Huanucoviej to Chonta, Peru, where the mine is situated, was a different story. The way is wild and rough, over roadless mountains, mountain streams, 15,000-ft. elevations and other natural hazards.

The first leg of the trip found Cia. de Aviacion Faucett delivering to Huanucoviej all equipment in three flights of 100 minutes each. Total weight transported was four tons. At the airfield the engine was unloaded with a home-made crane. Then the equipment was placed on crude carts and shoulder poles and pulled, tugged and hoisted some 50 km. to Chonta.

Eighty-five natives, who lived right on the job, made the trip in ten days. They had with them their *mantas,* also small buckets in which to cook, and carried supplies of rice and corn to eat along the way.

The Faucett company, which supplied the transportation over the first leg of the distance, was established in 1928, and is said to have carried more passengers and miscellaneous cargo than any other air-transport company in Peru. Prices for transporting mining machinery are arranged by contract and on the ton-mile basis vary greatly with conditions. Some of the variables are the distance, altitudes, and number of trips per day.

Planning for Optimum Rate of Draw in Cave Mining

A method is developed and its advantages are explained

Tell Ertl
Assistant Professor of Mining
University of Kansas
Lawrence, Kan.

THAT a cave-mining orebody can be mined at an optimum rate, influenced by many factors, is a logical deduction from general operating experience. The maximum rate of draw is perhaps limited by the maximum speed with which the orebody caves, because the too rapid drawing at fixed points in an orebody causes pipes to be formed through it and up into the waste capping above. These pipes into the waste dilute the ore as mined, and so cut off portions of the orebody that they can never be economically recovered. Undesirable results of drawing a caving orebody less rapidly than the optimum rate of draw are (1) that an unnecessarily large number of points must be established, operated, and maintained, and (2) that more of the weight of the overlying caving orebody is transmitted to these points and much extra expense is incurred in maintaining and repairing them.

The rate of draw is calculated either as square feet of undercut area per ton per day, or, preferably, tons per day per square foot of undercut area. For a given required daily production mined at the optimum rate of draw, a definite undercut area must be drawn each day. This is not the total area which was undercut under each block of ore being mined, but is the total undercut area under all the blocks being mined, minus the area not being drawn because of repairs and that not being drawn because of unprofitably low-grade ore.

At a western porphyry-copper caving property it was noticed that at certain periods too much undercut area was being drawn and at other times too little. When too much area was being mined, the ore was being drawn more slowly than the optimum rate, with all of the attendant extra costs associated with such a condition, and when too little area was being mined production generally dropped below requirements.

The reason for these fluctuations in drawable undercut area was that no satisfactory method was employed to assist in accurately predicting when the producing blocks would be exhausted, or when new blocks would have to be started, developed, and undercut, to offset the decrease of production caused by exhaustion.

As soon as this was realized an effort was made to develop a satisfactory method of planning the order and time of developing and mining the various blocks of ore, so that the required production could be mined at the optimum rate of draw, and further, to endeavor to keep the monthly average grade approximately constant. The remainder of this paper will explain the method finally developed and the advantages resulting from this method.

The basis of the method is shown in the two charts shown in Figs. 1 and 2. Fig. 1 is a chart showing the rate at which ore can be drawn from a block at any time during the life of the block. The straight-line portion of Fig. 1 is an experience line. It shows the percentage of the total block area of a block that will be available for drawing at any time during the life of the block. Studying this line further, it is seen that during the early part of a block's life: that is, when it is being undercut; the speed of the undercutting of the block determines what percentage of the block area will be available for drawing. This part of the chart is then determined individually for any block by the mine operator, and depends entirely on the speed of the undercutting operation. But as soon as the block is completely undercut the "percentage of the block area available for drawing" is 100, and remains at 100 percent for half the life of the block (until half of the expected ore is drawn out). Then, because pressure begins to develop, some drawpoints are shut down for repairs, or else, because of waste dilution from pipes into the waste, some drawpoints are shut down to aid in dispersing these pipes. For these reasons the "percentage of the block area available for drawing" gradually decreases from 100 percent, when 50 percent of the expected ore is drawn to 60 percent when 100 percent of the expected ore is drawn. Immediately before the block is completely drawn many of the drawpoints are still available for ore drawing.

After this "percentage of block area available for drawing" line is decided upon from observation of actual results, the curve in Fig. 1 is determined. This curve shows the "tons of ore drawn per day per square foot of undercut area" from the undercut area available for draw. At the property under discussion complete records had been kept of the original tonnage and grade expected from a block, of the tonnage and its grade drawn during each month of the block's life, and of the total tonnage and grade mined from each block. With this information it was easy to calculate the percentage of the original tonnage that had been mined at the beginning of each month, to calculate the "tons of ore drawn per day per square foot of undercut area" during the month following, and then to plot the first figure as the abscissa and the second as the

Table I

Block A 10,000 sq.ft. 100,000 Tons @ 1.00% Cu

		Average % Drawn	Expected Grade
At beginning of 1st month	0 % drawn		
1st month (.06) (30) (.50) (10,000) = 9,000 tons		4.5%	(1.195) (1.00) = 1.195% Cu
At end of 1st month and beginning of 2nd month	9 % drawn		
2nd month (.08) (30) (1.00) (10,000) = 24,000 tons		21 %	(1.12) (1.00) = 1.12% Cu
At end of 2nd month and beginning of 3rd month	33 % drawn		
3rd month (.09) (30) (1.00) (10,000) = 27,000 tons		46.5%	(0.93) (1.00 = 0.93% Cu
At end of 3rd month and beginning of 4th month	60 % drawn		
4th month (.085) (30) (0.92) (10,000) = 23,500 tons		72 %	(0.84) (1.00) = 0.84% Cu
At end of 4th month and beginning of 5th month	83.5% drawn		
5th month (0.07) (30) (0.77) (10,000) = 16,000 tons		91.5%	(0.72) (1.00) = 0.72% Cu
At end of 5th month and beginning of 6th month	99.5% drawn		
6th month Remainder = 5,500 tons		102 %	(0.62) (1.00) = 0.62% Cu
At end of 6th month	105 % drawn		
Total = 105,000 tons			

Table II

Each block has 10,000 sq.ft. undercut area. Each block has an original expected grade of 1.00% Cu

	1st Month		2nd Month		3rd Month		4th Month		5th Month		6th Month		7th Month		8th Month		9th Month		10th Month		11th Month	
	Tonnage	Grade	T	G	T	G	T	G	T	G	T	G	T	G	T	G	T	G	T	G	T	G
Block A 100 000 tons	9,000	1.20	24,000	1.12	27,000	0.93	23,5[illegible]	[illegible]84	16,000	0.72	5,500	0.62										
Block B 125,000 tons	9,000	1.20	23,000	1.14	27,000	0.99	27,0[illegible]	[illegible].83	20,500	0.82	15,000	0.72	9,500	0.63								
Block C 150,000 tons	9,000	1.20	22,500	1.16	27,000	1.05	27,000	0.92	24,500	0.87	19,000	0.80	14,500	0.73	11,500	0.65	1,500	0.61				
Block D 175,000 tons	9,000	1.20	22,000	1.17	26,500	1.09	27,000	0.96	27,000	0.89	22,000	0.84	17,500	0.79	14,500	0.73	11,500	0.66	7,000	0.61		
Block E 200,000 tons	9,000	1.20	21,500	1.18	26,000	1.11	27,000	1.00	27,000	0.92	25,000	0.87	21,000	0.83	17,000	0.78	14,000	0.73	12,000	0.67	10,500	0.64

Block A draws 105% of expected tonnage at 92.8% of expected grade for a 97.5% Cu recovery
Block B draws 104.8% 92.6% 97.1%
Block C draws 105% 92.9% 97.5%
Block D draws 105.2% 92.5% 97.2%
Block E draws 105% 92.5% 97.1%

ordinate. This was done for each of the blocks for which good data were available and plotted as separate curves. The average of the curves for the individual blocks was calculated, this work resulting in the curve shown in Fig. 1. Inasmuch as the variation of the "percentage of block area available for drawing" was not one of data kept in the records, that line shown in Fig. 1 was used for the calculation of the area available for draw when plotting the curves for each block.

With Fig. 1 it is possible to predict the tonnage that will be mined during each month of the life of any block in the mine.

Fig. 2 is a curve showing how the "percent of the original grade" varies with the tonnage mined from a block, or better, the "percent of the original tonnage mined." To plot this curve the records of the performance of blocks mined out were again consulted. The "percent of the original tonnage mined" at the beginning of each month of every block's life had already been calculated for the plotting of the curve in Fig. 1. Then from these figures the "percent of the original tonnage mined" for the middle of the month was averaged and plotted as the abscissa of Fig. 2. The "percent of the original grade" was plotted as the ordinate of Fig. 2. This procedure was followed for each block for which satisfactory data were available, and plotted as separate curves. The average of the curves for the individual blocks was again calculated and the result is the curve shown in Fig. 2. With Fig. 1 it is possible to predict the grade of the ore that will be mined during each month of the life of any block in the mine.

By using both Fig. 1 and Fig. 2 the tonnages to be mined from a block any time in the future and its grade may be predicted, provided that the size of the block (its horizontal area and the tonnage contained), and the grade of the ore in the block are known beforehand. In cave mining the orebody is generally well enough known long before mining begins so that the size and the grade of any block can readily be determined.

To illustrate the use of Figs. 1 and 2, let us take as an example a block of ore 100 ft. long by 100 ft. wide and 125 ft. high, and of a grade of 1.00 percent copper. This block contains 100 by 100 by 125, or 1,250,000 cu.ft. of ore; and if 12.5 cu.ft. weigh a ton, this block contains $\frac{1,250\,000}{12.5} =$ 100,000 tons. Table I shows how this block will perform if it behaves according to the data plotted in Figs. 1 and 2.

The block, of course, has 0 percent of its horizontal area available for drawing before undercutting begins, and the operator can readily fix any speed of undercutting that is convenient. It is assumed, in Table I, that at the beginning of the first month 0 percent of the area is undercut and that the operator causes undercutting to proceed at such a speed that at the end of the month 100 percent of the block is undercut; also that the average percentage of block area available for drawing during the first month is 50 percent. Then from Fig. 1 it is seen that a block 0 percent mined at the beginning of the first month will be drawn at the rate of 0.06 tons of ore per day per square foot of undercut area. Therefore (0.06 tons per day per sq. ft.) x (30 days) x (50 percent undercut area available) x (10,000 sq. ft. of area) = 9,000 tons, which will be mined during the month, provided that the block is worked 30 days. At the end of this first month the percentage of the original 100,000 tons mined is 9 percent. From Fig. 1 it is found that a block 9 percent drawn at the beginning of the month will be mined at the rate of 0.08 tons per day per square foot of undercut area. Also, since undercutting is complete, it is seen that 100 percent of the undercut area is available for drawing. Then

Fig. 1 left . . . Chart showing rate at which ore can be drawn from a block at any time during the life of the block. Fig. 2 right . . . Curve showing how the "percent of the original grade" varies with the "percent of the original tonnage mined"

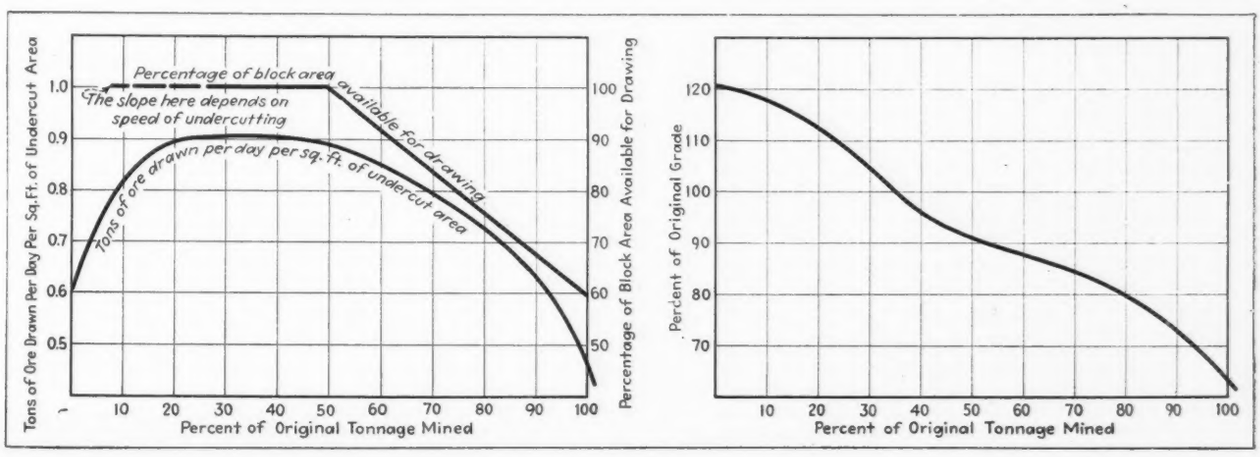

Tons of Ore Drawn Per Day Per Sq.Ft. of Undercut Area
Percentage of Block Area Available for Drawing
Percentage of block area available for drawing
The slope here depends on speed of undercutting
Tons of ore drawn per day per sq. ft. of undercut area
Percent of Original Tonnage Mined
Percent of Original Grade
Percent of Original Tonnage Mined

Table III

		Month	13 Tonnage	13 Grade	14 Tonnage	14 Grade	15 Tonnage	15 Grade	16 Tonnage	16 Grade	17 Tonnage	17 Grade	18 nnage	18 Grade	19 Tonnage	19 Grade	20 Tonnage	20 Grade	21 Tonnage	21 Grade	22 Tonnage	22 Grade	23 Tonnage	23 Grade	24 Tonnage	24 Grade	25 Tonnage	25 Grade	26 Tonnage	26 Grade	27 Tonnage	27 Grade	28 Tonnage	28 Grade
Block 36 175,000 tons	10,000 sq.ft. @ 1.12%Cu	Estimated	7,000	0.68																														
		Actual																																
Block 37 160,000 tons	8,000 sq.ft. @ 1.16%Cu	Estimated	3,500	0.71																														
		Actual																																
Block 38 225,000 tons	15,000 sq.ft. @ 1.20%Cu	Estimated	9,500	0.80	8,000	0.77																												
		Actual																																
Block 39 120,000 tons	12,000 sq.ft. @ 1.00%	Estimated	18,000	0.72	7,500	0.62																												
		Actual																																
Block 40 150,000 tons	10,000 sq.ft. @ 1.04%	Estimated	14,500	0.76	11,500	0.68	3,000	0.63																										
		Actual																																
Block 41 150,000 tons	12,000 sq.ft. @ 1.08%	Estimated	24,500	0.88	18,000	0.78	11,500	0.68																										
		Actual																																
Block 42 140,000 tons	8,000 sq.ft. @ 1.10%	Estimated	14,000	0.87	11,500	0.80	9,000	0.73	5,500	0.67																								
		Actual																																
Block 43 240,000 tons	12,000 sq.ft. @ 1.14%	Estimated	25,000	0.95	20,000	0.89	17,000	0.83	14,500	0.76	12,500	0.73																						
		Actual																																
Block 44 100,000 tons	10,000 sq.ft. @ 1.18%	Estimated	24,000	1.32	27,000	1.10	23,500	0.99	16,000	0.85	5,500	0.73																						
		Actual																																
Block 45 150,000 tons	10,000 sq.ft. @ 1.22%	Estimated	27,000	1.12	25,000	1.06	19,000	0.97	14,500	0.89	11,500	0.79	2,500	0.74																				
		Actual																																
Block 46 150,000 tons	12,000 sq.ft. @ 0.98%	Estimated	27,000	1.12	32,500	0.97	32,000	0.87	25,000	0.80	18,000	0.71	11,500	0.62																				
		Actual																																
Block 47 262,500 tons	15,000 sq.ft. @ 1.02%	Estimated	40,500	0.98	40,000	0.91	33,000	0.86	26,000	0.81	22,000	0.74	17,000	0.67	19,500	0.62																		
		Actual																																
Block 48 200,000 tons	10,000 sq.ft. @ 1.06%	Estimated	27,000	1.06	27,000	0.97	25,000	0.92	21,000	0.88	17,000	0.83	14,000	0.77	12,000	0.71	10,500	0.68																
		Actual																																
Block 49 300,000 tons	15,000 sq.ft. @ 1.12%	Estimated	32,000	1.32	39,000	1.24	40,500	1.12	40,000	1.03	37,500	0.97	31,500	0.93	25,500	0.87	21,000	0.82	18,000	0.75	15,000	0.72												
		Actual																																
Block 50 140,000 tons	8,000 sq.ft. @ 1.20%	Estimated	7,000	1.44	17,500	1.40	21,000	1.31	21,500	1.15	21,500	1.07	17,500	1.01	14,000	0.95	11,500	0.88	9,000	0.79	5,500	0.73												
		Actual																																
Block 51 150,000 tons	10,000 sq.ft. @ 1.16%	Estimated			9,000	1.39	22,500	1.34	27,000	1.22	27,000	1.07	24,500	1.01	19,000	0.93	14,500	0.85	11,500	0.75	2,500	0.71												
		Actual																																
Block 52 80,000 tons	8,000 sq.ft. @ 1.00%	Estimated			7,000	1.20	19,000	1.12	22,000	0.93	19,000	0.84	13,000	0.72	4,500	0.62																		
		Actual																																
Block 53 187,500 tons	15,000 sq.ft. @ 1.04%	Estimated					13,500	1.25	34,500	1.18	40,500	1.03	40,500	0.92	31,000	0.85	22,500	0.75	14,000	0.65														
		Actual																																
Block 54 240,000 tons	12,000 sq.ft. @ 1.08%	Estimated					10,500	1.30	26,000	1.27	31,000	1.20	32,500	1.08	32,500	0.99	30,000	0.94	25,000	0.89	20,000	0.84	17,000	0.79	14,500	0.72	12,500	0.69						
		Actual																																
Block 55 140,000 tons	8,000 sq.ft. @ 1.10%	Estimated							7,000	1.32	17,500	1.29	21,000	1.20	21,500	1.06	21,500	0.98	17,500	0.84	14,000	0.87	11,500	0.80	9,000	0.73	5,500	0.67						
		Actual																																
Block 56 120,000 tons	12,000 sq.ft. @ 1.14%	Estimated									10,500	1.37	29,000	1.28	32,500	1.06	28,000	0.96	19,000	0.82	6,500	0.71												
		Actual																																
Block 57 150,000 tons	10,000 sq.ft. @ 1.02%	Estimated									9,000	1.22	22,500	1.18	27,000	1.07	27,000	0.94	24,500	0.89	19,000	0.81	14,500	0.74	11,500	0.66	2,500	0.62						
		Actual																																
Block 58 262,500 tons	15,000 sq.ft. @ 1.18%	Estimated											13,500	1.42	33,000	1.37	40,000	1.29	40,500	1.08	40,500	1.05	33,000	0.99	26,500	0.93	21,500	0.86	17,000	0.78	10,500	0.72		
		Actual																																
Block 59 240,000 tons	12,000 sq.ft. @ 1.06%	Estimated											10,500	1.27	26,000	1.25	31,000	1.18	32,500	1.06	32,000	0.97	30,000	0.92	25,000	0.88	20,000	0.83	17,000	0.77	14,500	0.71	12,500	0.68
		Actual																																
Block 60 150,000 tons	12,000 sq.ft. @ 1.22%	Estimated													11,000	1.46	27,500	1.39	32,500	1.21	32,000	1.09	24,500	1.00	18,000	0.88	11,500	0.77						
		Actual																																
		Total	300,500	1.029	300,500	1.011	300,000	1.020	300,500	1.008	300,000	0.988	301,000	1.016	299,500	1.031	285,000		24,400		187,000		130,500		104,500		73,500		34,000		25,000		12,500	

Practical application of Fig. 1 and Fig. 2 may be demonstrated from this table

the tonnage to be expected from this block during the second month, if the block is operated for 30 days, is (0.08) x (30) x (100 percent) x (10,000) and equals 24,000 tons. This use of Fig. 1 is continued in Table I until the tonnage that is to be mined during each month of the block's life has been determined.

After determining the tonnages to be mined during each month of the life of the block, as illustrated in Table I, Fig. 2 is employed to determine the grade of the ore that will be mined during each of these months. It is seen that the "percent of the original tonnage mined" for the middle of the first month is 4.5 since 0 percent was mined at the beginning of the month and 9 percent was mined by the end of the month. From Fig. 2 it is found that the grade to be expected when a block is 4.5 percent drawn is 119.5 percent of the original grade of the entire block. Inasmuch as the original grade of the block used in the example is 1.00 percent copper, the grade of the ore mined during the first month will be (119.5 percent) x (1.00) or 1.195 percent copper. It is further seen in Table I that the "percent of the original tonnage mined" for the middle of the second month is 21 percent, inasmuch as 9 percent was mined by the beginning of the second month and 33 percent by the end of the second month.

From Fig. 2 (see page 57) it is found that the grade to be expected when a block is 21 percent drawn is 112 percent of the original grade of the entire block. The grade of the ore mined during the second month will be (112 percent) x (1.00) or 1.12 percent copper. This use of Fig. 2 is continued in Table I until the grade of the ore that is to be mined for each month of the life of the block has been determined.

Every block in the mine has either a different undercut area, a different original tonnage, or a different original grade than any other block, and consequently estimates of the tonnages and grade of the ore to be mined from any block must be calculated separately for each individual block. Table II shows the tonnage and grade to be mined each month from five blocks, all of which have an undercut area of 10,000 sq. ft. and a grade of 1.00 percent copper, but which vary in the thickness and therefore in the tonnage of ore per block. As can be seen from Table II, the block with the least tonnage will be mined out most rapidly, while the block containing the most tonnage will be mined for the longest period of time. Note also that during the first month the tonnage and grade drawn from each block will be the same (assuming that all blocks were undercut in the identical manner), but that in the fifth month 16,000 tons at 0.72 percent copper will be mined from Block A while 27,000 tons at 0.92 percent copper will be mined from Block E.

Because, in the past, an average of 105 percent of the original ore was mined from each block at a grade of 92.6 percent of the original grade for a copper recovery of 97.2 percent, any predictions made from Figs. 1 and 2 will predict a duplication of this situation. This is evident from the data in Table II.

Table III is the table which shows the practical application of Figs. 1 and 2. To illustrate this application, it is assumed in Table III that at a hypothetical block caving property it is desired to mine 300,000 tons per day month, from an orebody that averages 1.09 percent copper. From previous experience in this orebody it is known that the ore drawn averages 92.6 percent of the original grade of the ore, so that from an 1.09-percent copper orebody, an ore averaging 1.01 percent can be mined. Inasmuch as the grades of the various blocks of the orebody vary from 1.22 percent copper to 0.98 percent, it must be endeavored to mine the blocks of ore in such an order that the monthly average grade of ore mined should remain almost constant. But this is possible only to a limited extent because it is more important in a cave mining operation to mine the blocks in a certain pattern than it is to mine the same grade of ore each month throughout the year.

Making Use of Figs. 1 and 2

Table III is set up so that on the left side are seen the description of the blocks in the numerical order in which they are to be mined. The first month shown on the table is Month 13 which can be assumed as the present month. The first block listed is Block 36; the former 35 blocks have already been mined. Employing Figs. 1 and 2, it is found that Block 36 will produce 7,000 tons of 0.68 percent copper ore during Month 13, that Block 37 will produce 3,500 tons of 0.71-percent copper ore during Month 13, and so on through Block 50, when the necessary 300,000 tons monthly production is accounted for. Applying this use of Figs. 1 and 2 to Month 14, 15, etc., it is found that in Month 14 only 284,000 tons will be available from the blocks through to Block 50 and that Blocks 51 and 52 must be undercut at such a speed to produce 16,000 tons during Month 14. For Month 15 it is found that Blocks 53 and 54 must be brought in to produce 24,000 tons; for Month 16 it is found that Block 55 must be undercut so that it will produce 7,000 tons, and so on for the remainder of the life of the mine.

No other plan which will predict accurately when a block needs to be undercut in order to keep the productive undercut area at the amount necessary to insure the optimum rate of drawing, or to predict accurately the tonnage, and especially the grade that will be mined, from the orebody in future months has been described, so far as I know.

This plan yields many important benefits in the operation of the mine. Before it was instituted, the development work necessary to bring a number of blocks into production was done spasmodically; that is, when the mine began to get short of "muck" many contract miners would be placed on development work and much of this work would be rushed to completion. While this was being vigorously pushed, the mine would not be producing as much ore as was desired, and generally the grade would also be low because most of the blocks had been mined for a long period. Then, for a short time after this development work had been completed, the mine would find itself with too much undercut area available for drawing and with the ore being mined of a much higher grade than the average ore expectancy. Consequently the mine always went through alternate periods of lean months and fat months; periods when only 35 men were working on development and periods when 120 men were working on development.

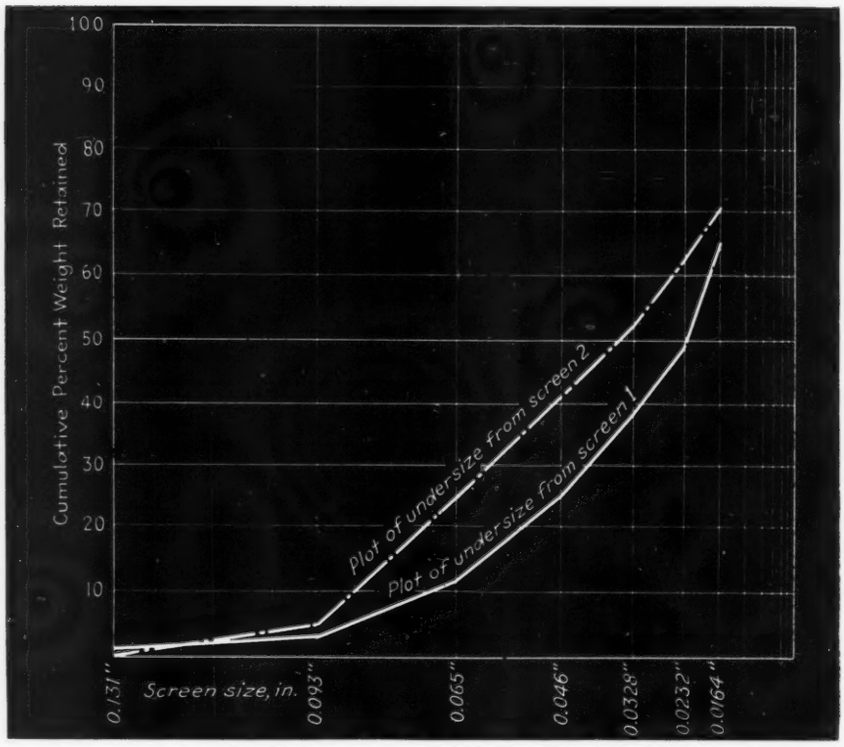
Following the application of this method of planning development speeds and future grade and production, it was found that a development crew of 50-55 men working steadily was sufficient to bring all blocks into production at the time desired. It was also found that the tonnage produced varied only 1.5 percent from that desired, while previously it had varied as high as 5 percent from the desired figure. Whereas formerly it was folly to attempt a prediction of the grade of ore to be mined in a future month, with this system of planning the average grade of all the ore to be mined during a month was always predicted at the beginning of the month within 0.01 percent copper. Since the grade was always predicted within 0.01 percent copper, and the tonnage within 1.5 percent, the mine copper production for any month was usually predicted at the beginning of a month with less than 1 percent error, because the two errors of prediction were frequently compensating errors.

These are only a few of the important money-saving advantages to be derived from the employment of such a method of planning. The ease of introducing such a plan and the low cost of operating it are so small compared to the savings which accrue from its operation that it should certainly be given a trial at any cave-mining property where some such procedure is not already being employed by the company.

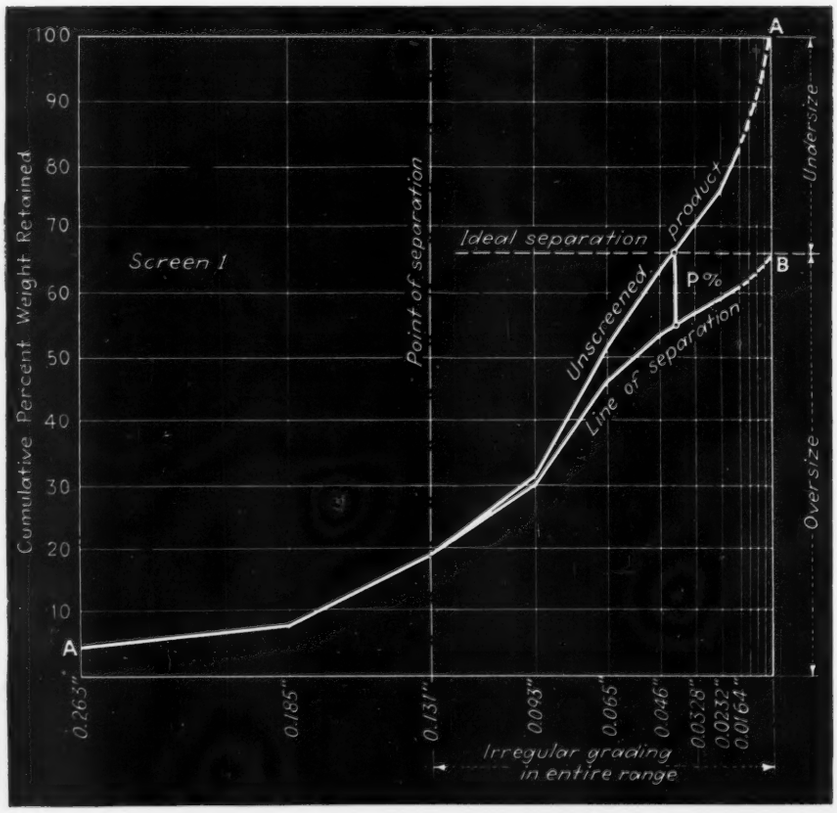
To Evaluate the Performance of a Screen

New graphic analysis provides clear picture of sizing operations

Rudolf Kohn
Winipeg, Manitoba, Canada



Above: Fig. 1 . . . Comparison of two screens on basis of sieve analysis of screen undersize. Separation made at 0.131 in. Below: Fig. 2 . . . Performance of screen No. 1, Fig. 1, shown by new method. Indicates poor separation



IN CONSIDERING the ordinary screening operation, no uniform method has as yet been devised for reckoning screen efficiency. Generally the ratio of weight of screen undersize to weight of undersize in the screen feed is used for this purpose, but the method leaves much to be desired.

The average efficiency, calculated in this way, of commercial operations is about 60 percent;[1] a figure which is unreasonably low, because of the extreme difficulty, even in laboratory screen analysis, of approaching 100 percent efficiency. To increase recovery of undersize, certain operators use screens of larger mesh than the desired separation, depending on experience or experiment in choosing the proper size. I have worked out a graphical method which will give a more realistic picture of screen efficiency and will aid in determining optimum size of screen for a given separation.[2]

Graphical methods now in use are discussed in *The Profitable Use of Testing Sieves*, a booklet published by W. S. Tyler Co., Cleveland, Ohio. Fig. 1, an example of one method, shows a comparison of two screens based on size analysis of their respective screen undersizes. Apparently No. 2 is superior to No. 1, but no indication of individual efficiency is furnished by this method.

To evaluate graphically single screen performance, the following method may be used: samples of screen feed, oversize, and undersize are analyzed by testing sieves in the ordinary way. Next, the ratio of weight of screen undersize to weight of screen feed is calculated, using feed and oversize analyses, expressed in cumulative percent weight, as a basis.

Then, on the same graph form as in Fig. 1, the feed assay is plotted and a curve drawn similar to curves, A-A, in Fig. 2 and Fig. 3. Then each cumulative percent value in the screen oversize assay is multiplied by the ratio of screen oversize to feed and the resulting values are plotted as ordinates on the graph, measuring up from the horizontal axis.

The screen undersize assay values are now multiplied by the ratio of screen undersize to screen feed and plotted on the graph as ordinates, measuring this time down from the feed curve already drawn. Ordinarily, the points plotted for oversize and undersize will nearly coincide and a smooth curve can be drawn in a median position among them. This curve represents the separation characteristic of the screen in use.

For example, Fig. 2, drawn in this manner, shows the performance of screen No. 1, whose undersize was graphed in Fig. 1. Fig. 3 shows similar curves for screen No. 2 of Fig. 1. Note that the separation line (A-B) in Fig. 2 does not flatten, but continues to rise throughout its length. This means that all sizes of material, including the finest, can be found in the screen oversize, and a poor separation is indicated.

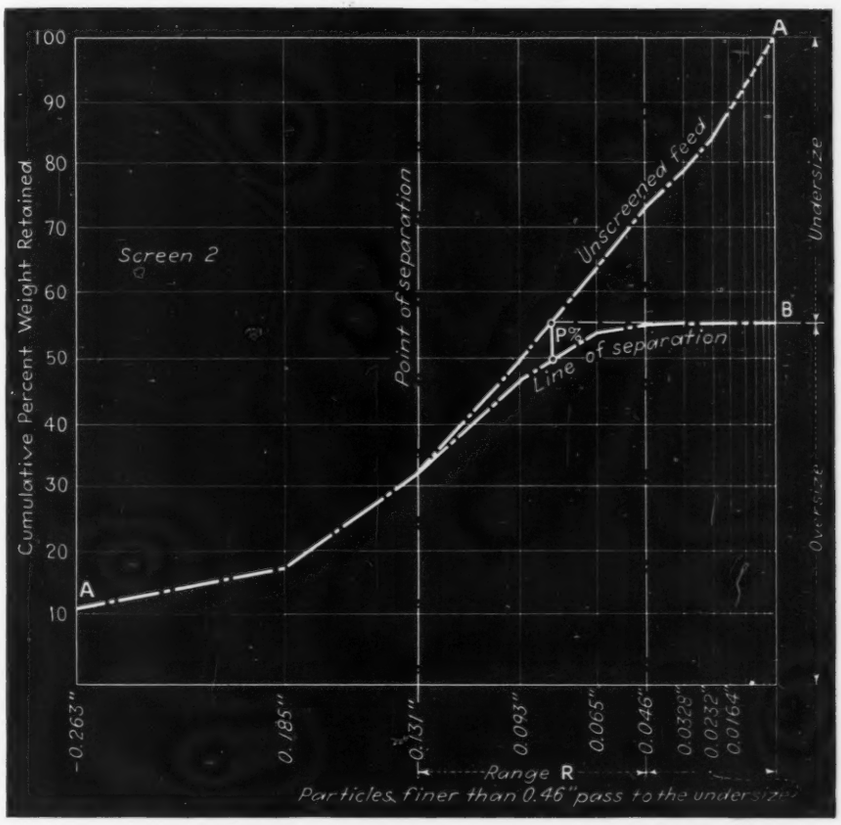
On the other hand, the separation curve for screen No. 2, Fig. 3, rises at a steadily decreasing slope and at a size of 0.046 in. becomes horizontal. This means that no material finer than 0.046 in. (14 mesh) was found in the screen oversize. This separation, therefore, though not excellent, is a definite improvement over that of screen No. 1.

Evaluation of screen performance from these graphs is obtained in two ways: first, by the length of range, R, which is the size range of imperfect separation; second, by the length of line, P, which measures the quantity of ungraded material. The shorter these distances become, the more closely does the separation approach the ideal condition of 100 percent efficiency.

Fig. 4 indicates these relationships more clearly. Curve A-A is the graph of the screen analysis of the feed to an industrial screen of mesh, M. Curve A-B is the graph of the under-oversize separation performed by the screen. M_o may be called the point of free passage, beyond which the curve A-B is horizontal and a perfect separation is obtained. If this horizontal line is extended to intersect curve A-A, and a vertical line is then drawn from this point on A-A to intersect curve A-B, the screen size corresponding to this line, M_t, will be the size of testing sieve which would produce an ideal separation between over and undersize in the same weight ratio obtained by the industrial screen.

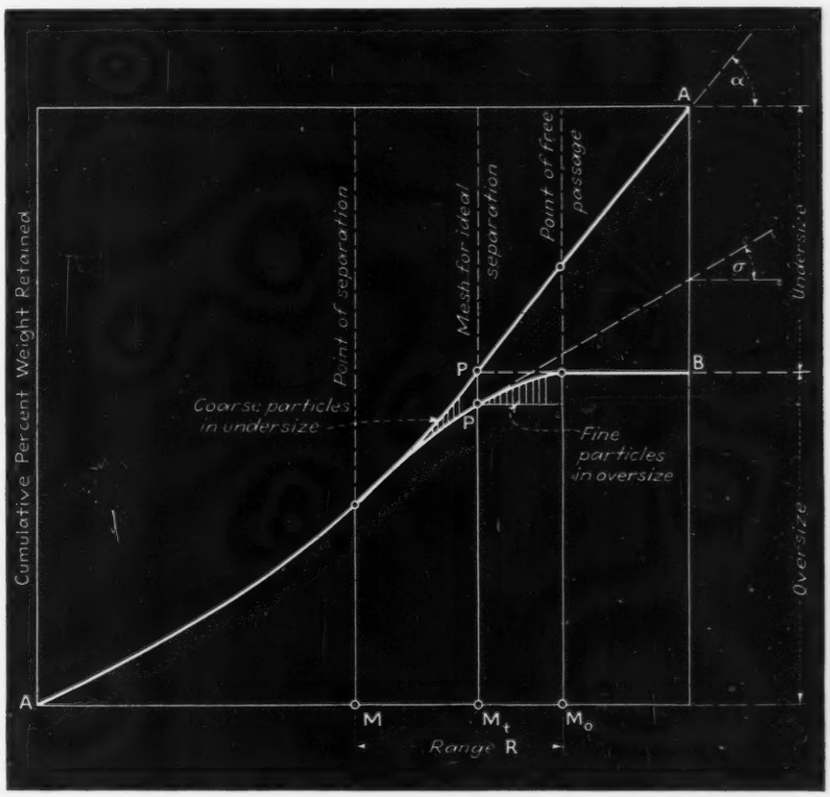
This line, P-P, also represents the percentage of the undersize composed of particles coarser than M_t, and the percentage of screen oversize finer than M_t. The probability of particles of the size M_t passing through the screen is given by the expression, $1-\frac{\tan \sigma}{\tan \alpha}$, in which σ is the angle of the separation curve at the intersection

(*Continued on page 94*)



Above: Fig. 3 . . . Performance of screen No. 2, Fig. 1. Indicates improved separation.

Fig. 4 . . . General relationships of various elements used in graphing screen performance



Asbestos in South Africa

The Union is producing all essential varieties

W. E. Sinclair
Cape Asbestos Co., Ltd.
Koegas, via Prieska
South Africa

IN SOUTH AFRICA, asbestos mining will undoubtedly take its place alongside the base-metal industries. Here, the value of asbestos production is already over £500,000 per annum. The Union is actually producing all the varieties of asbestos usually required by manufacturers. Indeed, this country possesses commercial deposits of nearly every known variety and is actually producing large quantities of the three most important—namely, chrysotile, crocidolite, and amosite. Small quantities of anthophyllite and tremolite are also recovered intermittently as required.

The different chemical and physical qualities of asbestos have led to the differentiation of the various classes for specialized commercial uses, depending on the fiber length, tensile strength, flexibility, and acid-resistance.

Chrysotile is a fibrous variety of serpentine and a class of asbestos valued for its silky flexibility and the high tensile strength of its fibers, which are pure white and soft and silky when fiberized, making the long grades particularly suitable for spinning. It is also superior to other varieties in heat-resistance, withstanding temperatures of 2,000 to 3,000 deg. C. without fusing. In treatment, the fibers are graded according to their length and, by a grading machine, into the commercial grades: crude fiber, spinning fiber, shingles, and asbestos-cement fiber.

Crocidolite, or "blue" asbestos, consists essentially of ferrous iron and silica with varying amounts of sodium oxide and magnesia and lime. In its fibrous form, it is more resistant to acids or sea water than other classes and the fibers are of greater tensile strength but not as silky or as heat-resisting as chrysotile. In preparation, the fiber is graded according to quality and length and is shipped in four hand-cobbed grades from ¼ in. to 2 in. and over, and in two mill grades corresponding approximately to the shingles and asbestos-cement fiber grades in the chrysotile class.

Amosite asbestos is a variety of the orthorhombic amphiboles, which, like crocidolite, is peculiar to South Africa, although a similar type of asbestos of the cummingtonite and grunerite group is found in Massachusetts. Chemically amosite differs from crocidolite in having a smaller ferric oxide content but more magnesia and smaller amounts of soda and alumina. It occurs in the same rock formation as the other, but its fibers are much longer, heavier, and harsher and are more heat-resistant. Otherwise it resembles blue asbestos except that the fiber is whitish to gray and brown and averages 5 to 6 in. in length. For this reason, in grading it (it is produced only as long fiber over 1½ in. in length) the main considerations are color and quality.

Tremolite and anthophyllite are among the less common commercial varieties because of comparative scarcity and unsuitability for spinning. The first, although white and of silky quality, is of weak tensile strength. Anthophyllite exhibits the same weakness and the fiber is brittle.

These various classes of asbestos may occur in three different ways, namely: (1) as cross-fiber veins in which strands of fiber are perpendicularly disposed to the fissure, (2) as slip-fiber veins in which the strands are found lying flat and more or less parallel to the veins, and (3) in mass-fiber deposits in which the veins are scattered irregularly through the rock. The first is the most common and all the classes mentioned are found occurring in this way, the lodes in different instances varying in width from a few feet to 100 ft. or more. Chrysotile, however, is also found in the form of slip-fiber or mass-fiber formations, which also are the more general types in which anthophyllite asbestos occurs.

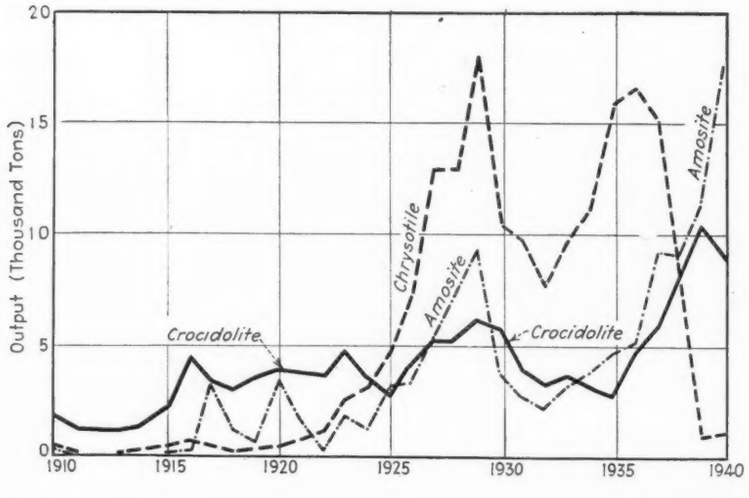
In most of the best known deposits in South Africa, the fiber occurs as cross-fiber seams forming narrow "reef" channels or extending through the formation to form wide deposits.

Distribution — Pioneer prospectors found traces of asbestiform minerals in the northwest Cape Province early in the nineteenth century. This was a stepping stone to other discoveries in various parts of the country. The distribution of the main asbestos fields is discussed in the following; likewise the geological occurrence of the different classes of asbestos:

Chrysotile—The serpentine rocks of the Jamestown series of the Swaziland system, and in cases the serpentinized dolomites of the Dolomite series, are the rocks in which chrysotile asbestos predominantly occurs. The more persistent and better fiber is found in the serpentine rocks occurring near Kaapsche Hoop, 28 miles northwest of Barberton, where the main producing mines have been operating for 20 years. Twenty miles south of Barberton, large-scale production of chrysotile fiber from serpentine in Swaziland has recently begun. Smaller deposits have been located in the serpentines elsewhere in the Transvaal and Natal —namely, in the Tugela Valley near Eshowe and near Dundee, where a small production has been maintained.

Chrysotile from serpentinized dolomite is not consistently of the quality of that from the serpentine rocks. The main known occurrences are lens-like deposits near Carolina and Graskop, in northeastern Transvaal, and at Kanye, in Bechuanaland. Only a small output has been won from these deposits because of the limited size of most of them. Many other occurrences

Tonnage of chrysotile, crocidolite and amosite asbestos respectively, produced in South Africa in last 30 years



have been reported in various places, but insufficient work has been done to prove their economic value.

Crocidolite—The various forms of blue asbestos occur in the banded ironstone of the Lower Griquatown series of the Transvaal System in Cape Province, and in the Transvaal in the corresponding rock system, the Pretoria Series.

The Cape deposits occur at intervals along a strike of the ironstone series known as the Asbestos Mountains, extending over 250 miles from Prieska to Kuruman. Here the crocidolite occurs in lenticular cross-fiber veins. Two or more series of parallel lodes in the contorted and folded beds of the ironstone usually constitute a deposit.

The fibrous varieties of crocidolite consist of blue fibers of varying shades from dark steel to light blue, and they vary also in physical structure from wire-like needles to a softish texture. Average length of fiber is ½ in. but may be 3 in.

Occurrences of crocidolite in the Transvaal are in the lower beds of the Pretoria Series near Pietersburg. The general character of the deposits closely resembles those of the Cape. Fiber quality, however, is not so good, because of its harshness and tendency to brittleness.

Amosite—Deposits of amosite occur in extensive areas in the same series as the Transvaal crocidolite, with which it is closely associated in the formations near Pietersburg. Further south, along the Olifants River, the principal deposits occur at intervals between Chuniespoort and the Steelpoort River, 60 mi. north of Lydenburg. Here the main production is taking place today. The amosite occurs in the banded ironstone in the same manner as the crocidolite, but is unsurpassed in length, which averages about 6 in. This fiber derived its name from the initial letters of the company which first developed the occurrence—Asbestos Mines of South Africa.

Tremolite and Anthophyllite—The former occurs as slip-fiber in deposits near Pomeroy in Zululand, and the second mainly in a deposit at Corea, 50 mi. northwest of Waterpoort Siding, in Northern Transvaal.

Producing Mines—The value of the total production of asbestos in South Africa from earliest records to date is well over £6,000,000. The total quantity of all classes produced in the Union in 1940 amounted to 28,236 tons, valued at over £550,000. These figures take no account of the large production from Swaziland, nor do they include the regular output of chrysotile from the Rhodesian mines.

The mining concerns producing these five different classes of asbestos are located in the Transvaal, Cape, and Natal, the largest production being from the first-named and the smallest from the last.

Output—The former steady production of chrysotile asbestos in the Union from the Amianthus and Munnik Myburgh mines has now practically ceased because of the exhaustion of these well-known Kaapsche Hoop deposits. The first-named was celebrated for the high value of its lode and the unusual length of some of the fiber, which reached 10 to 12 in. The neighboring mine (Munnik Myburgh) was renowned for the high quality of its fiber, a small production of which still continues from tributing operations on outcrop pillars and clean-up work.

The serious drop in production of this class of fiber has been more than counterbalanced by the recent opening of the new Havelock mine, in Swaziland, 12½ mi. south of Barberton, to which town the mine is connected by an aërial tramway crossing the Emlembwe Mountain. The estimated annual output of 24,000 tons of chrysotile is to be recovered from a mass-fiber deposit in soft green serpentine, in a body averaging 100 ft. wide and dipping at 55 deg. The mineral-bearing rock occurs in a serpentine and chert formation. Mining consists first of quarrying down to the first level and below this stoping by shrinkage and top-slicing, most of the ore being sorted underground and trammed to surface through adits. A modern power plant and an up-to-date mill have been erected. Output consists of the following grades of fiber: No. 1 spinning fiber, No. 2 spinning fiber, No. 3 shingle fiber. The first two are intended chiefly for production of textile products; the shingle grades are used mainly for asbestos-cement building materials, pipes, and mill board.

Small and irregular outputs of chrysotile have been made in Natal at the Sitile and Emakabeleni mines.

The main production of crocidolite, or "blue" asbestos, is in the Cape Province, where the best quality fiber occurs. The Cape Asbestos Co. operates several mines in the Prieska and Kuruman districts, where the deposits are scattered and the mines are often miles apart. The crocidolite veins occur as narrow lodes, which in the south end dip steeply but otherwise are nearly horizontal. In both classes of deposit, shrinkage stoping is the usual practice, waste rock being left as ground support and also, in the steeply inclined stopes, to support the men working at the face. Three of the large mines in this group (Westerberg, Klipvlei, and Mansfield) are equipped with compressed air, and development and stoping are done by jackhammers. With one exception, all the mines in this field at this stage of exploitation are worked through adits. Half the total output is hand-cobbed fiber of mostly long grades. At Westerberg and Koegas, treatment mills produce two short grades: S, ¼ to ½ in., and X, ¼ in. Other common grades are: ½ to ¾ in. and the long-fiber grades B or E, ranging in length from ¾ in. to 2 in. and over[1].

Besides the Cape Asbestos Co., there are nine other small concerns operating in the N.W. Cape asbestos field, the total production from which is now well over 6,000 tons annually, valued at £170,000.

The production of the silicified form of crocidolite (tiger's eye) has dwindled to not more than 200 tons a year. The big demand for this popular ornamental gem stone was once responsible for the sale of the mineral by the carat at a good price, a position, however, that was eventually spoilt by

[1] "The Production of Crocidolite in the Cape," by the author, I.M.M. Bulletin, Feb., 1941.

Amosite outcrops at Penge, in the Transvaal

At a chrysotile mine in the Transvaal. A motor train coming out of the adit

some anthusiast who started shipping the stuff by the truckload!

In the Transvaal, a small production of crocidolite is proceeding in the Malips River district, near Pietersburg, where an inferior class of the blue variety occurs with typical amosite asbestos. Mining in the Transvaal blue field has been restricted to comparatively shallow outcrop work, and, except for the mining and milling of the Cape Asbestos Co. at Malips Drift, production is derived mainly from about 25 sundry tributors, whose work has been simplified by the prominent reef outcrops on high mountain slopes where open-cut or shallow adits assist in easy exploitation. The total output of Transvaal "blue" amounts to about 1,800 tons a year.

The only known commercial source of amosite fiber is in South Africa, where production is being carried out at the main mines of the Egnep Company at Penge, near Lydenburg. Since the exploitation of amosite began in 1915, there has been a steady, increasing demand. Output was over 17,000 tons in 1930.

The gray-white color of amosite, due possibly to its lower soda content, and the remarkable fiber lengths, are its outstanding features. The large available tonnage in this field is mined for present requirements by stoping from adit levels driven in to intersect the lodes in the mountainous country. The dip varies from 20 to 40 deg. and shrinkage stoping is practiced, all long fiber being sorted out underground. Waste and ore of no value are left as filling. Sorting is facilitated because a large percentage of the fiber is over an inch long and light in color. The ore is hand-cobbed to free the longer fiber and is then crushed in jaw crushers and rolls. Finally, the fiber is screened and classified into three grades: No. 1, a light-gray fiber used for spinning and acid filtration; No. 2, a yellowish fiber employed principally for heat insulation; and No. 3, a discolored grade used for insulation purposes and for asbestos-cement production.

A small irregular output of anthophyllite has been maintained by the New Gloria mine and the Corea Asbestos Mines, in the Zoutpansberg district in Northern Transvaal. This asbestos occurs as slip-fiber and is produced and prepared mainly for the local market under the trade name of "asbestic."

Intermittent production of tremolite asbestos has proceeded in Natal and Zululand for some years, where the fiber has been mined by small companies operating in the Sitilo and Dundee districts of Natal and near Pomeroy, in Zululand.

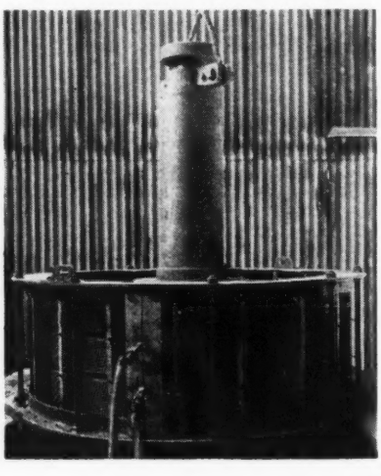
Many more asbestos companies have been floated at various times to work deposits in different parts, and although not now producing, they will no doubt come into their own in due course, since the production capacity of the Union for every class of asbestos is greater than the present output.

Today a large part of the country's output is exported, not more than 2 percent of the total production being consumed locally, but as the local industrial demand grows, increased production will be necessary. The fact that the varied classes of fiber are available here makes the value of this industry of even more importance, because one or more of the different types of asbestos can be applied with definite success in all of the many applications to which this non-metallic mineral is put.

Electric Heater for Roll Shell

OF VITAL IMPORTANCE in war time is the necessity of reducing plant shutdowns to a minimum. Any new repair method or contrivance that will cut repair time, therefore, is of importance. Such a device has recently been developed at the concentrator of Braden Copper Co., Sewell, Chile, S. A., and a brief description is of interest. The roll-shell heater illustrated in the accompanying photograph offers two advantages: (1) material reduction in time required for fitting roll centers with new shells: and (2) it makes the operation a safer and cleaner job.

As to construction, the heater consists essentially of a coil of 51 turns of three No. 1/0 solid "Deltabeston" wires in parallel, wound on transite battens spaced equally around its periphery. The unit is reinforced with two steel rings held together with large brass bolts, and is designed for 550 volts, 60 cycles, and single phase.



For taper-bore shells the method of application is as follows: The roll center and shaft are set up vertically with the shell in place so that it may drop down on to the center by its own weight when expanded by heating. Next, the heater unit is lowered into position surrounding the complete assembly, and power is applied to the coil. This effects a heavy circulating current in the shell, thereby producing direct and uniform heating. As the temperature rises, the shell expands and finally drops into proper position. When this has taken place, the current is turned off, the shell tightened, and the coil removed. For straight-bore shells the method of procedure is the same except that the shell must be heated separately, and subsequently dropped over the roll center.

MINE, SHOP, AND PLANT

An Approaching Crisis

RUBBER-CONSCIOUS AT LAST, or he should be, the industrial user will do well to consider the manufacturer's advice, born of experience, on how to secure the maximum life from the rubber he has in service, whatever its application. This advice is easy to get. Realizing how serious the situation-minus-rubber would be in the mine, plant, or shop that has been geared to its use, important suppliers have come to the front urging all to adopt the ways for conserving their products that they have proved for themselves to be good. Their bulletins on the subject have been noted in *E.&M.J.*'s Equipment News pages from time to time and are worthy of attention.

Conserving the Conveyor

LONG PROMINENT IN THE MILL, the belt conveyor has been finding increasing application underground and in open-pit work. Scarcity of belting, in consequence, will be more widely felt than formerly. Care in handling belts and operating them was never more justified than now. An important manufacturer talks to the point:

Careful handling of a belt during installation will bring its reward later. Be careful about creasing, folding, straining, or subjecting it to sharp bends which may break the carcass and lay the groundwork for failures.

In designing the installation there are several things which can add materially to productive life. One is the arrangement of the feeder by which material is delivered to the belt. A chute with a V-shaped notch cut in the end will save the belt much wear at this point by discharging fine material first to provide a protective layer against the impact of heavy lumps. This can also be achieved by installing a screen chute made of non-clogging, wedge-shaped bars between which fine material can drop first on the belt.

Material which is to fall any distance should be retarded by suspended baffles, and spill plates should be put in to take the impact of direct loading where insufficient headroom prevents ideal chute design.

In any case, avoid direct loading impact on the belt and, as a further precaution, locate a carrying idler 4 to 6 in. behind the heel of the loading chute and another a short distance ahead. This provides support at the point of greatest impact and yet enables the belt to cushion the fall of heavy material. Never place a carrying idler directly under the loading point.

To provide additional cushioning on heavy-duty installations, carrying idlers near the loading point should be equipped with either rubber-covered or rubber disk rolls, or rubber-mounted idler assemblies.

Speed is important. An installation should be designed to operate at a proper speed to insure a full, uniformly distributed load. Thus, wear will be equal across the width of the belt, and, since wear on the belt cover is due largely to abrasion at the loading point, this is proportionately less with respect to tonnage handled when the belt is fully loaded. The result is a greatly increased tonnage life as compared to that of an under-loaded belt traveling at higher speed. Mechanical feeding equipment or surge-bin arrangements are the most satisfactory means of accomplishing this uniform feed.

However, installations designed to handle extremely hot material should be arranged to run at a relatively high speed to provide a shallow load so that material can be discharged before it has time to burn or harden the belt cover.

In selecting pulley diameters care should be taken, as pulleys that are too small are detrimental to the flexing life of the carcass. Pulley diameters for single drives should be not less than 5 in. for each ply, and 6 in. for tandem drives. On installations where belt traction becomes a problem, this factor can be increased 40 percent under dry conditions by lagging the drive pulley. Special 2- to 4-ply lagging material with a rubber cover on one side is available, although a satisfactory length can be cut from a regular belt which has been retired from service. In either case, the material should be fastened to the pulley with special flat-headed bolts and should be examined regularly for replacement when worn.

Provision should be made for removing tramp iron from any conveyor circuit. When conveying non-magnetic material, this may be done with a magnetic head pulley or magnet suspended over the load. Even the expense of manual removal would be more than justified.

Lumps or quantities of moist, sticky material should be prevented from falling through to the pulley side of the belt and being carried around the tail pulley where severe damage to the belt may result. This can be done by decking built over the return half of the belt at points where spillage may occur or by brushes or scrapers to remove the material before it reaches the tail pulley.

Avoid, however, the excessive use of scrapers and also any skirt boards or side guide rollers which may be necessary. All these add to the abrasive wear the belt must undergo, particularly in the case of skirt boards and side rollers, which attack the belt at its vulnerable edges where the carcass can easily be laid open to the attack of moisture and rot.

Better than rigid side guide rollers are pivoted self-aligning idler units which can be used in unusual circumstances. Ordinarily, where conveyors are installed with all pulleys and idlers square to the center line, and a belt of the proper flexibility for perfect troughing has been used, and material is loaded evenly, the belt will train perfectly without external control devices.

Spacing of idlers is important and should be arranged so that the belt receives ample support. Belts which are allowed to sag unduly may suffer damage from the impact of lumps against the belt at the point where it lifts over the idlers. Creasing and premature breakdown in the belt are common, and power consumption rises.

Take-up devices should be carefully engineered and applied at the most effective point on the return side, usually after the drive. In small installations screw-type take-ups at the tail pulleys are generally satisfactory. Large installations, and those where long centers are involved, should be equipped with a counterweight type take-up which will permit the belt to adjust itself automatically to changes in length between empty and full-load

Preventive Maintenance

"ACCIDENTS DON'T JUST HAPPEN — they are caused." This slogan of the safety man can be applied to machinery and equipment as well as to employees. The function of maintenance parallels that of safety work with equipment substituted for human beings. In both cases its purpose is primarily preventive—to avoid the things that mean loss and injury, that hamper the production effort and, today, hinder the war program. Preventive maintenance was never more important than now. Together with repair work it is the job of the electrical and mechanical departments. These are often combined in one maintenance department reporting to the chief engineer.

tensions and at the same time maintain the desired slack tension. With either type, there should be just enough tension to handle the load without slippage and this should be periodically checked.

As to maintenance, inspect the belt regularly for damage to the cover and see that even the most minor cuts are promptly repaired. Moisture, acids, and fine materials gaining entrance to the carcass through even the smallest puncture frequently cause serious unseen damage. Self-vulcanizing cement and plastic rubber compounds are available for quick, serviceable repairs of the sort.

In using this material, the edges of the cover are trimmed back far enough to remove loose rubber, surfaces are cleaned and roughened, two coats of cement are added, and the rubber is rolled into place.

By the use of small portable electric vulcanizers, more permanent repair jobs can be effected and in some cases even new patches of fabric can be cured into place at damaged spots by experienced workers.

Inspect idlers regularly to be sure they turn freely. A frozen or hard-running idler can cause severe belt wear and can make belts run out of line, fail to carry their loads properly.

Lubrication of idlers should be done under a strict schedule and with care. Besides causing damage to anti-friction bearings, too much grease will overflow any type of bearing, come in contact with belt covers, and cause permanent injury. If the belt is exposed to the sun or in a place where the temperature is high, this action, of course, is accelerated.

Belt fasteners should be watched. Loose, broken, or badly worn fasteners should be replaced and all should be kept well-tightened. If one is loose or broken, it can tear a belt for its entire length.

Where circumstances such as extreme tensions and heavy belts warrant the expense involved, field-vulcanized, ply-stepped splices are ideal means of making belts endless. However, the right type and size of fasteners will usually prove satisfactory.

Conveyors should be covered or completely housed for protection against weather, particularly sunlight, which is extremely damaging to rubber. But housings should be such that belts and idlers are always accessible for inspection and repair.

Enemy Action

READY TO DESTROY RUBBER if given a chance are its enemies —oils, greases, solvents, concentrated acids, extreme heat, dryness, sunlight, and ozone. Combined, their destructive action may be speeded up greatly. Other things, such as water, rot, alkalis, dilute acids, and many gases, may attack the fabric or metals combined with the rubber, even though leaving the latter untouched.

More About Motors—Their Inspection and Lubrication Must Be Systematic

A MOTOR - MAINTENANCE PROGRAM really begins as soon as the motor has been properly connected, according to O. F. Vea, who was cited in these pages last month. First as to making the connections. These, he says, should be tight enough so that vibration will not loosen them. Wires joined in a conduit box should be twisted together and soldered, or bolted together, and the joint wrapped with rubber tape, and then with friction tape.

Wires issuing from a conduit box, especially rubber-covered extension cords, should be held in such a way that there is no strain on the connections. Usually a knot in the wire inside the box, or the use of conduit-box fittings that grip the wire, is most convenient.

When starting a motor for the first time, a little extra care is a good investment. Look at the brushes of a d.c. or single-phase repulsion motor to see that they are seating properly on the commutator, and with proper pressure. Turn the motor over by hand before applying power to be sure that it turns freely and that no foreign material or object has fallen in.

Once the motor has been properly connected, inspection and servicing should be systematic.

Frequency of inspection and degree of thoroughness will vary. They will be governed by the importance of the motor, the percentage of time it operates, the nature of its service, and its environment. The inspection schedule must therefore be elastic. The following one, covering both a.c. and d.c. motors, is based on average conditions in respect to dirt and duty:

Every Week

1. Examine commutator and brushes.
2. Check oil level in bearings.
3. See that oil rings turn with shaft.
4. See that shaft is free of oil and grease from bearings.
5. Examine starter, switch, fuses, and other controls.
6. Start motor and see that it is brought up to speed in normal time.

Every Six Months

1. Clean motor thoroughly, blowing out dirt from windings, and wiping commutator and brushes.
2. Inspect commutator clamping ring.
3. Check brushes and renew those more than half worn.
4. Examine brush holders and clean if dirty. Make sure that the brushes ride free.
5. Check brush pressure.
6. Check brush position.
7. Drain, wash out, and renew oil in sleeve bearings.
8. Check grease in ball or roller bearings.
9. Check operating speed or speeds.
10. See that end play of shaft is normal.
11. Inspect and tighten connections on motor and control.
12. Check current input and compare with normal.
13. Run motor and examine drive critically for smooth running, absence of vibration, worn gears, chains, or belts.
14. Check motor foot bolts, end-shield bolts, pulley, coupling, gear and journal setscrews, and keys.
15. See that covers, belt and gear guards are in good order and securely fastened.

Once a Year

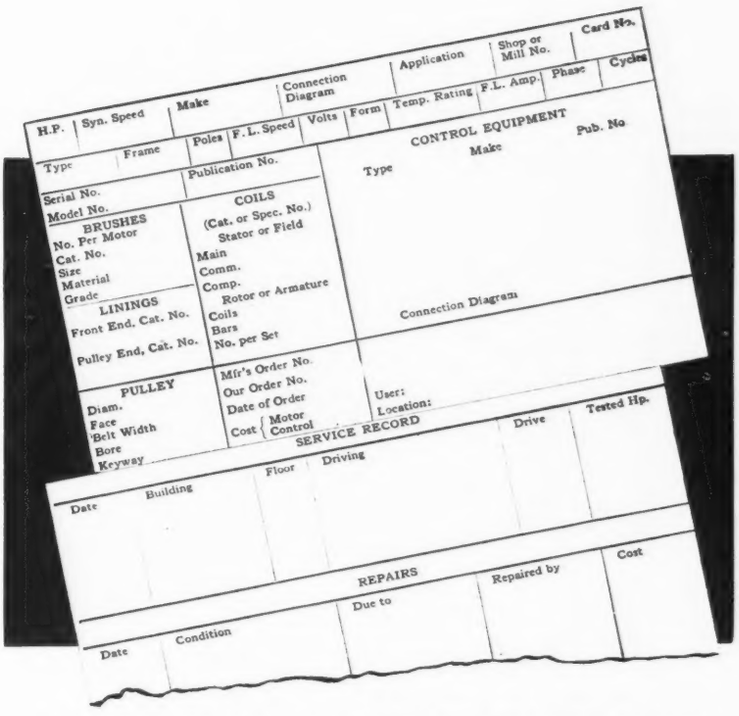
1. Clean out and renew grease in ball- or roller-bearing housings.
2. Test insulation by megger.
3. Check air gap.
4. Clean out magnetic dirt that may be hanging on poles.
5. Check clearance between shaft and journal boxes of sleeve-bearing motors, to prevent operation with worn bearings.
6. Clean out undercut slots in commutator.
7. Examine connections of commutator and armature coils.
8. Inspect armature bands.

The maintenance man should have a record card for every motor in the plant. A suitable card for this purpose is shown. All repair work, with its cost, and every inspection can be entered on it. Thus excessive attention or expense will show up and the causes can be determined.

Inspection records will also serve as a guide to tell when motors should be replaced because the cost of keeping them in operating condition has become too high. Misapplications, poor drive engineering, and the like will also be disclosed.

Proper lubrication is one of the major features of a motor-maintenance program.

Bearings of modern motors require only infrequent attention. However, oiling and greasing of new motors is often entrusted to men used to lubricating older designs. As a result, oil or grease may be copiously applied to the outside as well as inside of bearing housings. Some of the excess will be carried in and will lodge on the windings, where it hastens ultimate failure.



A card record such as this should be kept for every motor in the plant, as an essential to a well-ordered maintenance program

For ball-bearing lubrication only a high grade of grease should be used having the following general characteristics: Consistency a little stiffer than that of vaseline, maintained over the operating-temperature range; melting point preferably over 150 deg. C.; freedom from separation of oil and soap under operating and storage conditions; and freedom from abrasive matter, acid, and alkali.

Care must be taken not to add too much grease or it will cause too high an operating temperature, with resulting expansion and leaking of the grease.

For greasing ball-bearing motors equipped with a pressure-relief greasing system, make sure that no dirt gets into the bearing with the grease by wiping clean the pressure-gun fitting, bearing housing, and relief plug. Always remove the plug from the bottom of the bearing before using the gun, to avoid putting excessive pressure inside the housing and possibly rupturing the bearing seals. Free the relief hole of any hardened grease, and with the motor running (or if this is dangerous, with it standing still), add grease with a hand-operated gun, until it flows from the hole. Then let the motor run until the rotating parts expel all excess grease from the housing. This prevents over-greasing the bearing. Finally, stop the motor and replace the relief plug tightly.

A motor not equipped with the pressure-gun fitting and relief plug cannot be greased by the foregoing procedure. Under average conditions, the grease with which bearing housings of such motors were packed before leaving the factory is enough to last about a year. When this period has elapsed, and once a year thereafter, the old grease should be replaced with new.

To do this, disassemble the bearing housings and thoroughly clean the inside of the housings, the housing plates, and the bearings with carbon tetrachloride. Then reassemble all parts except the outer caps, or plates. Apply new grease, by hand or tube, over and between the balls. The amount varies with the motor type and frame size. The instructions which came with the motor should be consulted.

Addition of the correct amount fills the housings one-third to one-half full. More than this must not be used. When reassembling the motor, any V-grooves in the housing lip should be refilled with grease—preferably a fibrous, high-temperature-sealing grease—to serve as an additional protective seal.

The technique for greasing motors having roller bearings is like that for ball bearings. Specific instructions for the individual design should be followed, however, because more frequent greasing or slight changes in technique may be necessary.

With sleeve bearings, the oil level in the housings should be checked with the motor stopped. If the motor has an oil-filler gage, this should always be three-quarters full. If the oil is dirty, drain it by removing the plug, usually in the bottom or side of the housing. Then flush the bearing with clean oil until the outcoming oil is clean. In fractional-horsepower motors, there may be no means of checking oil level, as the oil may be held in the waste packing. A good general rule is to add 30 to 70 drops of oil at the end of the first year and every thousand hours of operation thereafter. Most fractional-horsepower motors built today require lubrication once a year. Small fan and agitator motors will need it more frequently, at say three-month intervals.

Sleeve-bearing housings are provided with liberal settling chambers for catching dust, dirt, and sludge. To clean remove the plug and drain the oil. Whenever the motor is disassembled for general cleaning, the bearing housing should be washed out with a solvent. Before being assembled, the bearing lining should be dried and the shaft covered with a film of oil.

As to cleaning ball bearings, the pressure-relief method of greasing motors described tends to purge the bearing housing of used grease. Complete cleaning of bearings, therefore, is required at infrequent intervals only. For a thorough flushing when the bearings are not disassembled, the following is recommended:

Wipe clean the housing, pressure-gun, and relief fittings, and then remove both fittings. Every care should be taken to keep dirt out of the bearings. If a bit of abrasive gets in, it may not be removed even with most thorough cleaning and may later get between the bearing surfaces, with serious results.

Free the pressure-fitting hole in the top of the bearing housing of hardened grease. Also, free the relief-plug hole in the bottom from old grease to permit easy expulsion of the old grease inside. Then fill a syringe with grease solvent, such as carbon tetrachloride, and inject some of it into the housing through the pressure-fitting hole, with the motor running. As the grease becomes thinned, it will drain out through the relief hole. Add solvent until it runs quite clear. Replace the plug and inject solvent until it can be seen splashing. Let the solvent churn a few minutes, then remove the relief plug and drain. Repeat the churning until the solvent runs clean.

When flushing with carbon tetrachloride, replace the relief plug and inject a small amount of light lubricating oil. Let it churn for a minute or two before draining. This will flush out the solvent. Then grease the bearing, using the method described.

This method permits the cleaning of all standard motors operating at an angle not exceeding 15 deg. from the horizontal, except totally inclosed, fan-cooled motors. For the latter, the bearing at the pulley end may be flushed as described. To clean the fan-end bearing, first remove the fan cover and fan to make the drain plug accessible at the bottom of the housing.

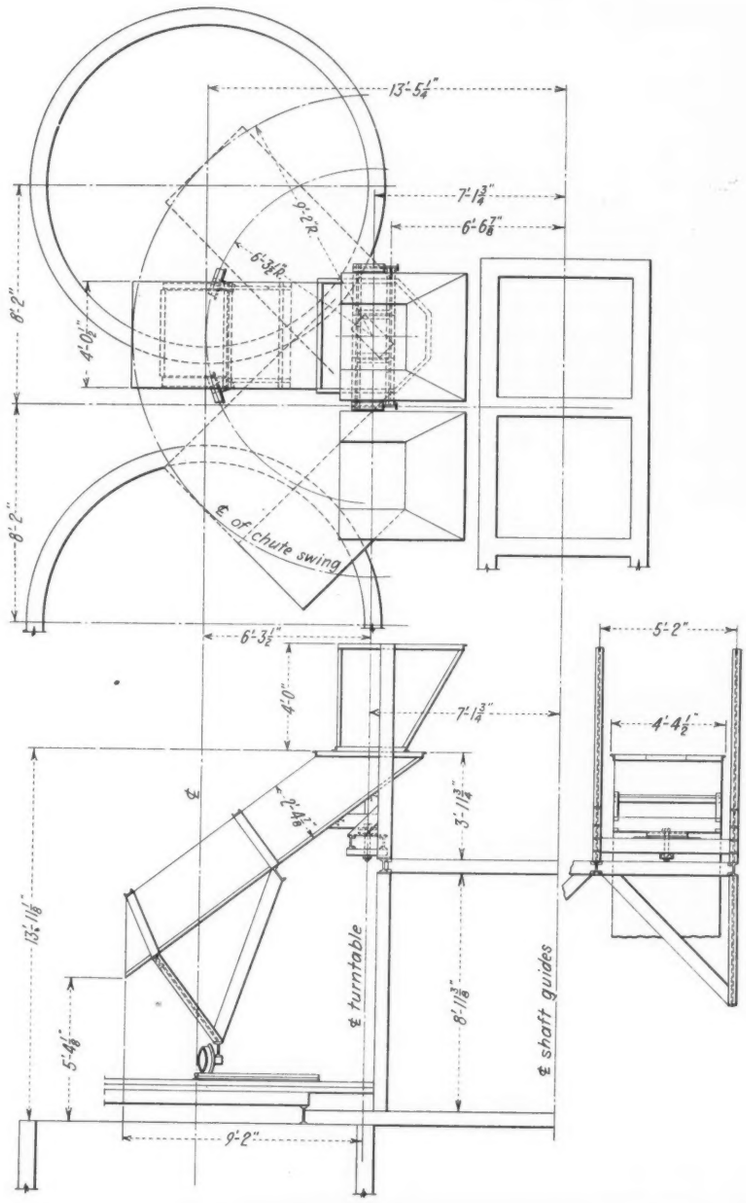
USEFUL OPERATING IDEAS

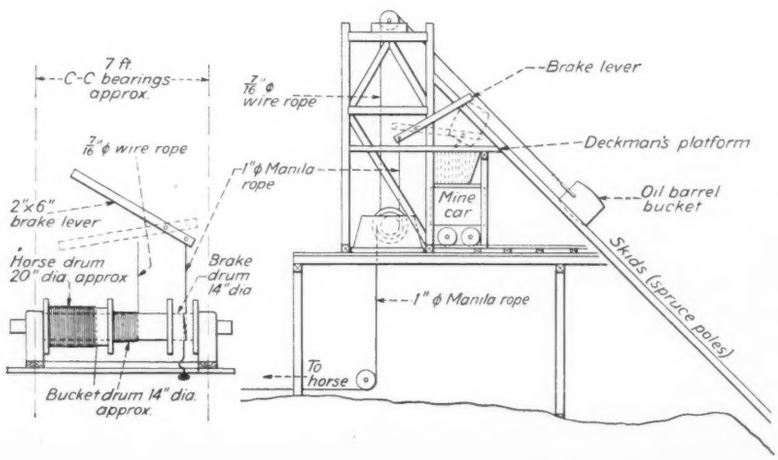
Novel Swing Chute For Storage Bins

AN INNOVATION at the new 1,752-ft., three-compartment Thaynes shaft of Silver King Coalition Mines Co., Park City, Utah, is a swing chute to direct hoisted material to respective storage bins. The shaft layout consists of a steel headframe, with a conventional skip-dumping mechanism; two steel receiving hoppers; and two circular concrete bins, one for ore and the other for waste. The latter material is transported to the nearby dump by a belt conveyor. To make possible dumping of ore or waste from the receiving hopper to one or the other bin required a movable chute. The mechanical department solved the problem successfully with the swing-chute arrangement shown in the accompanying drawing. It is of simple construction and easy to operate.

The chute proper is fitted at the upper end with a turntable arrangement, and at the lower end with two roller supports engaging the semicircular rail guide installed below the receiving hopper as shown. Relatively little effort is required to roll the chute from the center discharge point on one bin to the other. The semicircular roller guide is made from 30-lb. rail. The complete chute layout was made at the company's machine shop. Drawing and data were kindly furnished by M. J. Heitzman, manager.

This device should be of particular interest to small plants in which various grades of coal, sand, or gravel must be stored, but the same method may be applied to pulp distribution in mills.





Horse-Driven Hoist Drum

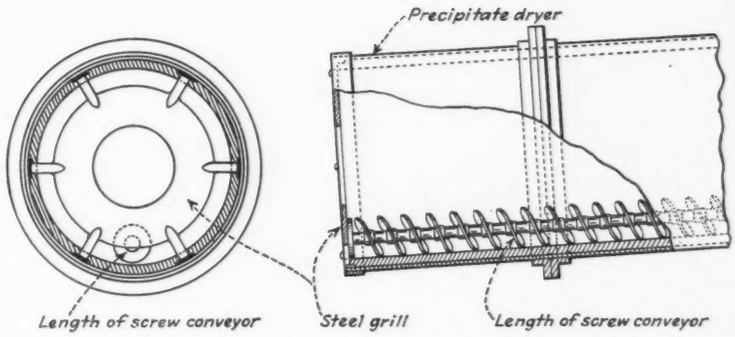
THE HORSE-OPERATED hoist drum shown in the attached sketches gained the taeit approval of a Quebec mine inspector at a prospect shaft sunk to a depth of about 125 ft. on the incline. (The law prohibits the use of a horse with a pulley block in shaft sinking.) The brake lever used was heavy enough to stop the horse or keep the loaded bucket from sliding back down the shaft. It was thought that the brake

rope might tighten automatically, but it did not. Men walked up and down the shaft.

The drum was made by an old timber man with the tools he had in his kit. Drum diameters, fleet angles, and the like were given rule-of-thumb consideration. Despite the high-overload capacity of a horse, some difficulty was encountered as depth increased, because of the tendency of the rope to pull too high on the shoulders of the horse.

As built up, the drum had a one-piece core of sound, straight birch, 10 ft. long and 9 in. in diameter after being trued up. The journals were 7 in. in diameter. Lagging and flanges were of rough lumber. The bearings were cut from 10x10-in. rough material.

When the bucket was dumped, the driver uncoupled the horse and the deckman lowered the bucket on the brake. On this relatively flat slope (less than 45 deg.) the runaway speed of the bucket was not high. In a vertical shaft one might wish for a better brake than a manila rope and a piece of 2x6-in. lumber. Inspection of ropes was regular and careful to insure safe operation.

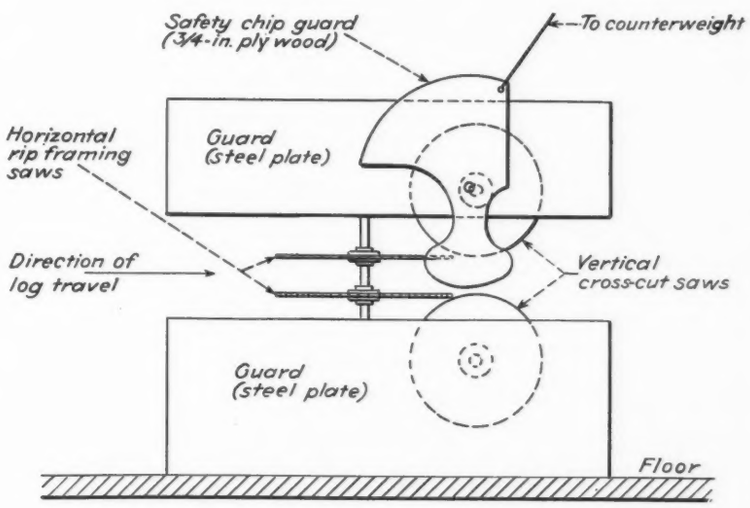


Dryer Operation Improved

AT THE NEW PLANT placed in operation recently by Goleonda Syndicate at Goleonda, Nev., the tungsten precipitates produced are dried in a small, oil-fired rotary dryer. After the unit had been in operation a short time it was found that the precipitate would cake and gradually build up in the drying zone, and as a consequence render difficult the discharge of succeeding material. To restore output to capacity, the dryer had to be stopped periodically, and the cake or crust chiselled out laboriously with long, sharpened steel bars. Several schemes were tried, but the problem was not solved until installation of the arrangement explained in the sketch.

As is seen, use is made of a length of screw conveyor operating freely in the drum interior. The material is thus prevented from caking in the drying zone, as well as kept moving constantly toward the discharge. The only extra part required is the steel end grill made from scrap material to prevent the length of screw conveyor from falling out.

▼ ▼ ▼



Safety Guard for Timber Framer

A SIMPLE, dependable auxiliary that has eliminated possible injuries to operators from wood chips and blocks thrown off the timber-framing machine has been developed at the carpenter shop of Mountain City Copper Co., Rio Tinto, Nev. As known, when framing timbers by machine the rip cuts are made first, followed by crosscutting. Accidents may occur at the point where the crosscut saws meet the timber to cut off the ripped block, and chips and blocks fall onto the speeding ripsaws to be thrown off by them at high velocity, with the possibility of hitting and injuring the operator.

The danger can be overcome by installing the guard shown in the sketch. It is made from ¾-in. plywood and actuated by the moving piece of timber, with the full side of the guard reaching the front of the saws as the crosscut is made. The operator standing at the side of the machine is thus protected. Action of the guard also takes place during the return of the timber to care for any residual débris left on the dap. This item was submitted by G. R. Beechel, chief engineer.

▼

Quick Switching For A.-C. Motors

GOOD PRACTICE at large mines and plants calls for keeping an assortment of spare motors and equipment on hand for use in breakdowns and emergencies, according to Paul C. Ziemke, Milwaukee, Wis. The handicap of odd voltages that require reconnection of the stator winding before the motor can be utilized usually exists. On some types of motors this can be time-consuming.

By way of making our list of a.c. motors more readily available within certain limitations, we have installed changeover switches in small cabinets and mounted them securely on the motor frame. Thus only a moment is required to adapt a motor from, say, 110 to 220 v., or from 220 to 440 v., depending, of course, on the type of winding.

As a case in point we have four Lincoln welders that are moved whenever welding is to be done. In the older section of the plant 220-v. 60-cycle a.c. current is available; in the newer portion 440-v. power is standard. Formerly any change of location from the older to the newer section meant a call for the electrician to check the voltage connection in use and to make changes if required. Now with the motors equipped with changeover switches, though the electrician

must still supervise any move to a new outlet, his work is simplified to the routine task of ascertaining which position the switch is in and checking the fuse sizes in the service cabinet. Experience has proved that such details cannot be left safely to the men welding or to their foremen.

These welders are pushbutton controlled through magnetic starters. Formerly it was necessary to reconnect the stator and the magnet coil and wrong connections could easily result where space was cramped, and the color faded from the magnet-coil leads. Since the coils are provided with split windings, the change-over switch connects these from series to parallel as the case may require. Other motors now equipped in this manner are on centrifugal pumps handling a variety of liquids. The switches function well on blower motors also.

The special switch is made by the Powerlite Switch Board Co., Cleveland, Ohio.

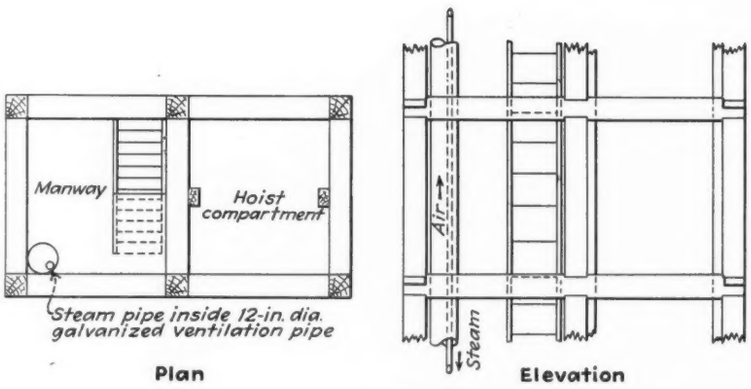
▼

Stator Winding

ARRANGING MATERIAL in a position convenient to the workman is a long step toward efficiency and good workmanship. In an electrical winding job where the whole thing can be ruined by one tiny defect in workmanship, every helpful step should be taken. An example, seen in the central maintenance shops of the American Zinc Co. of Tennessee, at Mascot, is a roller stand for supporting motor stators which are being rewound or repaired.

This stand is topped with two 3x22-in. rollers mounted parallel and with their bearings 15 in. apart. With

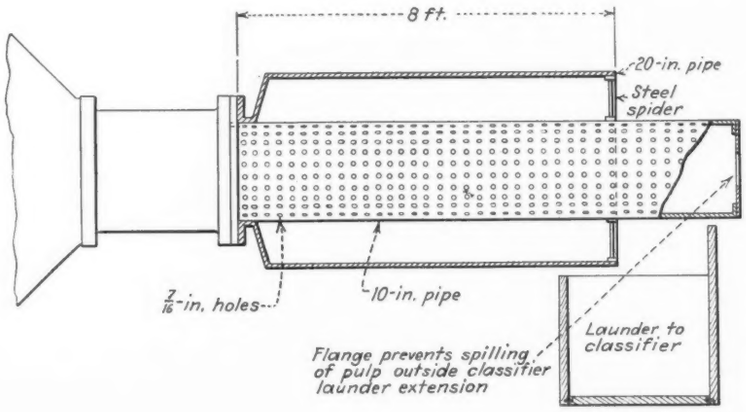
the stator placed thereon it can be turned by hand with safety and ease through a sufficient number of degrees to allow convenient access to all group or coil connections. In the illustration, electrician Henry Huff is soldering the connections of a newly rewound stator of a G. E. 35-hp., 2,300-v. 600-r.p.m. motor.



Hot Steam Line In Shaft

WHERE STEAM PUMPS are used underground, writes W. W. Schnarr, Noranda Mines, Quebec, the hot pipe sometimes constitutes a hazard to persons traveling the manway. In one shaft, 250 ft. deep and making considerable water, an air-driven duplex pump had been installed. The supply of air was limited, however, so it was decided to change to steam. Primarily to keep it dry, the steam line was lowered inside the 12-in. galvanized ventilating pipe, as shown in the sketch. In addition to the safety feature, it was found that a draft was developed in the ventilating pipe due to the heating of the air by the steam pipe. Though not as strong as that produced by the fan, it was continuous.

▼ ▼ ▼



Elongated Ball-Mill Discharge

A BALL-MILL AUXILIARY that has worked satisfactorily at the plant of General Metals Recovery Corp. at Millers, Nev., where tailings from the Tonopah Mining Co.'s mill were re-treated, and at the mill of Getchell Mine, Inc., near Redhouse, Nev., is the elongated ball-mill discharge shown in the accompanying sketch. It is designed to prevent wood chips and other foreign matters in the ground pulp from entering succeeding treatment units, and to give additional grade for closing the classifier circuit.

Constructed at the company's machine shops, the discharge unit essentially consists of a perforated trommel made from 10-in. steel pipe housed in a circular cover or catch basin for the trommel undersize. A piece of 20-in. steel pipe about 8 ft. long, is bolted to the trunnion of the ball mill. The holes in the trommel are $\frac{7}{16}$ in., and the open flange at the discharge end prevents spilling of pulp outside the classifier launder extension. It is removed when the trommel interior is to be cleared of wood chips, undersize balls, and other accumulated material.

Five Dollars for an "Idea"

SHORTAGE OF EQUIPMENT in the present emergency puts a premium on the ingenuity of master mechanics and electricians to keep mining and milling machinery running. If you have done an interesting job, just sketch or photograph it and send it in with a brief description. *E.&M.J.* will pay $5 for acceptable items.

PERSONAL ITEMS

H. J. R. Way was recently appointed Government Geologist of the Swaziland Protectorate.

R. C. Wilkin has been made Pacific Coast manager for Phelps Dodge Copper Products Corp.

M. H. Johnson has been made secretary of Ontario Nickel Corp., Ltd., and **Gordon McLaughlin** is now treasurer.

George Hallock, of Alleghany, Sierra County, Calif., has been elected president of the California Hydraulic Mining Association.

L. K. Jocobsen recently returned to the United States from Queensland, Australia, where he was with Mt. Isa Mines, Ltd.

W. S. Walker has left Regina, Saskatchewan, Canada, and is at Mackenzie, British Guiana, where he expects to remain for some time.

A. W. Tolonen, formerly with Anaconda Copper Mining Co. at Butte, Mont., is now with the U. S. Bureau of Mines at Little Rock, Ark.

Egon Nordlasder has been made general superintendent of the Alta Mines, at Ophir, Colo., following the resignation of **Marvin Katzenstein.**

Fred Foerster, for many years engineer in charge of dust control for Bralorne Mines, Ltd., is now employed in war industry in Vancouver.

Hubert O. Debeck, consulting geological engineer of Burnsville, N. C., is now chief of the mica production section, Branch K, Materials Division, WPB.

B. S. W. Buffam, consulting geologist, recently made an examination of the Kootenay Florence property in British Columbia, for Toronto interests.

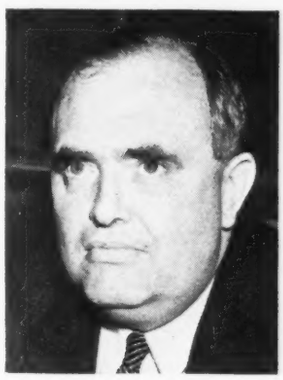
Harry Hey, chief metallurgist for Electrolyte Zinc Co. of Australia, Ltd., was recently elected vice president of the Australasian Institute of Mining and Metallurgy.

Hugh Leach has been transferred from the Douglas mine at Chisholm, Minn., to the mine at Crosby, Minn., where he will have charge of mining on the Cuyuna range for the Evergreen Mines Co.

Francis R. Pyne, metallurgist, Elizabeth, N. J., has moved to Washington, D. C., where he is associated with the copper branch, materials division, War Production Board.

Lieut. Col. George E. Cole, who has been in Ottawa for the past year, on loan from the Department of Mines and Natural Resources, Manitoba, to the Wartime Bureau of Technical Personnel, returned to Winnipeg on June 1 to resume his duties as Director of Mines.

Reginald S. Dean, chief of the Metallurgical Division, Bureau of Mines, has been appointed assistant director of the Bureau for the announced purpose of working with Director R. R. Sayers in "streamlining" the Bureau's administrative organization to enable it to meet the increased responsibilities thrust upon it by the war. Prior to joining the



REGINALD S. DEAN

Bureau's staff in 1929, Dr. Dean was employed in the research departments of American Zinc, Lead & Smelting Co. and Anaconda Copper Mining Co. For several years he has been in charge of the Salt Lake City station of the Bureau, where metallurgical research has been under way on treatment of domestic strategic minerals.

Errol MacBoyle, executive vice president, Idaho Maryland Mines Corp., Grass Valley, Calif., has returned to his office after a protracted business trip to Washington, D. C.

Edward H. Newhouse, Jr., president of Federated Metals Division of A.S.&R., has been elected vice president of that company, with which he has been associated since 1912.

G. R. F. Troop, secretary and treasurer of The Yukon Consolidated Gold Corp., Ltd., has been loaned to the Wartime Prices and Trade Board for part-time duty.

Lieut. Edward Pierce, chairman of the southern Saskatchewan branch of the C.I.M.M., was recently in Vancouver while on active service with the Royal Canadian Engineers.

C. D. Michaelson, formerly assistant superintendent at Llallagua, Bolivia, for Patiño Mines and Enterprises, is now works manager for United States Gypsum Co. at Midland, Calif.

K. R. McCoy has returned to the United States from Argentina, where he was mill shift boss at Mina Aguilar, Tres Cruces. His present address is Albany, Calif.

J. R. Terrill has left Fresnillo, Mexico, where he was assistant mine superintendent for Fresnillo Mining Co., and has gone to Parral as mine superintendent for Cia. Minera La Campana, S.A.

Austin L. Reid, formerly at Oatman, Ariz., has resigned his position with the U. S. Smelting, Refining & Mining Company, and is now employed as precipitation operator with the United States Vanadium Corp., Bishop, Calif.

M. Jordan Nathason, who has been secretary of the Quota Committee of the Premium Price Plan for copper, lead, and zinc, has been commissioned a Lieutenant Junior Grade in the Naval Reserve.

Alex Ranson, veteran manager of Nevada tungsten properties and lately in charge of a scheelite mine in western Utah for the U. S. Vanadium Corp., has recovered from a recent serious illness.

Bryan R. Frisbie, engineer long connected with the Newmont Mining Corp., is in charge of an open-cut cinnabar mine in western Elko County, Nev., for the New Verde Mines Co., reputed to be a Newmont subsidiary.

Newton B. Knox, mining geologist, Caracas, Venezuela, has gone to Guayaquil, Ecuador, as exploration engineer at the Portovelo mine of the South American Development Co. His address in Guayaquil is Sasilla 655.

John E. Byron, mining engineer of Boulder, Colo., has spent several weeks in Pershing County, Nev., supervising the survey for patent of a number of gypsum claims for U. S. Gypsum Corp.

Robert S. Moehlman, of the Anaconda geological staff and now directing prospect drilling at several points in Nevada for the International Smelting & Refining Co., Anaconda subsidiary, has established office headquarters in Reno.

L. G. Anderson has joined the staff of the U. S. Bureau of Mines at Duluth, Minn., under **Frank E. Cash,** district manager. His professional activities will include mine safety work in the Lake Superior area.

Ernest N. Patty, vice president and general manager, Gold Placers, Inc., Fairbanks, Alaska, was recently in Washington, D. C., and New York City. He has left for the company's headquarters in Alaska.

Howard I. Young, president of American Zinc, Lead & Smelting Co., has been elected a member of the executive committee of the Manufacturing Chemists Association, succeeding **William B. Bell,** president of American Cyanamid.

Jesse L. Maury has resigned his position as branch chief of the Consumers' Durable Goods Branch of the War Production Board, to take a position with the Office of Price Administration as Administrator of Premium Price Quotas of Non-Ferrous Metal Mines.

Sam S. Coldren, having completed his contract as civilian employee with the U. S. Army engineers on the Canal Zone, is now employed by Henry Altschuler, consulting engineer, of La Paz, Bolivia, developing and mining tin and tungsten.

J. K. Gustafson is directing a geological prospecting expedition this summer in the 20,000 square mile concession in Labrador, which Hollinger Consolidated

Gold Mines, Ltd., controls through control of Labrador Mining & Exploration Co., Ltd.

Eduardo Simian G. is now returning to Chile after having spent a year on geological work in the United States. He has been appointed geologist in the Departmento de Minas y Petroleo, Ministerio de Fomento, and his address will be Casilla 2683, Santiago de Chile, S. A.

A. W. Holloway has been engaged as mill superintendent by Consolidated Nicola Goldfields, Ltd., at Kamloops, B.C. **Bernard Brynelsen,** formerly with the Polaris-Taku Co., with operations at Tulsequah, B. C., is in charge of underground work.

D. L. King, until recently mill superintendent for Mountain Copper Co., Ltd., Matheson, Shasta County, Calif., has joined the staff of Gray Eagle Copper Co., which is reopening the Gray Eagle mine and building a 600-ton mill near Happy Camp, Siskiyou County, Calif.

George Bacon, formerly foreman for the Treadwell Yukon Corp., Ltd., at Mayo, Y. T., is now living in Victoria. Following the closing of Treadwell Yukon operations last fall, Mr. Bacon mined some high-grade silver-lead ore on leases from the company, making shipments to Kellogg, Idaho.

Frank Kennicott has resigned as mine superintendent of the Summit King Mines, Inc., at Fallon, Nev., and is now in Silverton, Colo., having accepted the post of general superintendent for the Highland Mary Mines, Inc., operating in that city.

R. L. Smith, engineer for the Standard Slag Co., of Youngstown, Ohio, has been directing preparations for extensive core drilling on large deposits of brucite owned by his company in the Mammoth or Gabbs Valley district in northwestern Nye County, Nev.

Basil Prescott, engineer formerly associated with **E. L. Cord** at Silver Peak, Nev., later operating cinnabar property in Pershing County, has left Lovelock for the Goodsprings district, Clark County, Nev., where he has acquired a zinc property under option.

George L. H. Loram has resigned as engineer for the Volo Mining Co., operators of the River View and Shaw mines, in El Dorado County, Calif., and is now at 26 Olivene St., Placerville, Calif. Mr. Loram is the son of Sydney H. Loram, a well-known consulting engineer residing in Valparaiso, Chile.

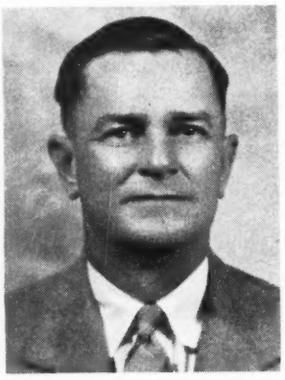
James R. Hobbins, president and a director of Anaconda Copper Mining Co., has been elected a director of the National City Bank, of New York City. He is also an official or a director in not fewer than twelve other mining, metallurgical, and industrial corporations.

Landon Strobel has assumed the post of secretary of the WPR-OPA Reserve Quota Committee. Mr. Strobel is a mining man who transferred to his present position from civilian service with the Army Ordnance Corps.

Henry Mulryan has resigned as plant superintendent for Gladding, McBean & Co., Los Angeles, manufacturers of refractories and other ceramic products, and will engage in business as a consulting geologist and mining engineer. He can be reached at 1334 Cordova Ave., Glendale, Calif.

J. R. Van Pelt, of Chicago, received the honorary degree of doctor of science at the annual commencement of Cornell College last month, for his contribution to greater public understanding of science and engineering. Dr. Van Pelt has been on the staff of the Museum of Science and Industry since 1928, first as head of the Mining and Metallurgy Department and later as assistant director and technical director.

Fremont E. Wood has returned to the United States from Cuba, and is now electrical superintendent for Basic Magnesium at Luning, Nev. For the past two years he has been engaged in a similar capacity by Minas de Matahambre, S. A., at Matahambre, Pinar del Rio, Cuba. Prior to that time he held a similar position for several years with Cuban Mining Co. at Cristo, Oriente, Cuba.



FREMONT E. WOOD

A. F. Buckham, of the Dominion Department of Mines and Resources, is in charge of a geological survey party now prospecting in the Shulaps Mountains serpentine belt for chrome and other war minerals.

Nelson W. Aldrich, former secretary to D. D. Moffatt, general manager and vice president of the Utah Copper Co., has been made head of the newly created industrial relations department, and **D. C. Houston,** assistant superintendent of welfare, has been made superintendent. Offices of the company are in the Kearns Building, Salt Lake City.

J. H. Marsman, in a public address at Reno, Nev., on June 23, described his capture by the Japanese on Dec. 6 and subsequent escape from Hongkong, where he had gone to attend the annual meeting of the Marsman-Hongkong-China, Ltd. Invited by **Governor Carville** of Nevada to speak in behalf of civilian defense, Mr. Marsman was the guest in Reno of **James O. Greenan,** formerly directing engineer for Marsman enterprises in the Philippines and elsewhere in the Orient.

B. E. LaLonde retired June 1, 1942, from active duty with the geological and mining departments of the Oliver Iron Mining Co. in Duluth, Minn. Mr. LaLonde served as manager of the U. S. Steel Corp.'s manganese property in Brazil and also spent some time in Liberia and Cuba. At the time of his retirement he was working in the Duluth office of the Oliver.

Frederick Laist, recently general metallurgical manager for Arizona Copper Mining Co., has been elected vice president in charge of metallurgical operations for the company, and **Clyde E. Weed,** general manager of mines for the company, is now vice president in charge of mining operations.

Paul J. Sirkegian, general superintendent for Consolidated Coppermines Corp., at Kimberly, Nev., presided at a recent meeting at Ely of the Nevada section of the A.I.M.E. in the absence of **Percy G. Dobson,** president of the section and manager for the Summit King Mines, Ltd., subsidiary of Bralorne Mines, Ltd.

J. R. Van Fleet, vice president and general manager of the U. S. Vanadium Corp., and **Blair Burwell,** general superintendent, were in Salt Lake City recently to confer with **David D. Baker,** who is in charge of operations in Utah. The New York officials visited the site of the new plant. **R. E. Little,** formerly of San Francisco, arrived recently to become office manager at the new plant.

▼ ▼ ▼

OBITUARY

Sam Hazlett, pioneer Australian gold miner and prospector, recently died in Perth. He was 70 years old.

G. W. Rutherford, manager, Gold Hill Dredging Co., of San Francisco, died recently at Loomis, Calif., aged 63.

Henry M. Sutton, president of Sutton, Steele & Steele, Inc., sales agents for Separations Engineering Corp., of New York, died on May 30 at Dallas, Tex.

Lyndon King Armstrong, 82-year-old veteran mining engineer of the Pacific Northwest, died in Spokane, Wash., on June 21. He had been a resident of Spokane for more than 50 years.

J. W. Allen, Australian mining man, who was associated with the flotation of the Broken Hill Mining Co., died recently at the age of 84. He was one of the founders of the Stock Exchange of Adelaide.

Ing. Francisco Valdes y Espinosa, prominent Mexican mining engineer and monetary expert who since 1917 had been director general of the National Mint, died, aged 63 years, in Mexico City on May 14 after a short illness.

Hedley D. Crowder, prominent British mining engineer in Mexico, died on June 4, aged 66 years, at Acapulco, Guerrero. He was a native of Durban, Natal, Africa, a graduate of the Royal School of Mines, London, and had been in Mexico since 1900.

Henry E. Loufek, known as "Hank" to Nevada miners, for many years the leading cinnabar miner of his State, president and chief owner of the Castle Peak Quicksilver Co. and owner of other mercury claims, died recently in Reno at the age of 56.

Dr. Andrew Stewart, a scientist on the staff of the helium division of the

U. S. Bureau of Mines at the time of his retirement in 1933, and a leading authority on helium, died on June 28 in Washington, D. C. His age was 74.

Col. Joseph Hyde Pratt, former consulting engineer and professor of geology at the University of North Carolina and State Geologist of North Carolina, died at Chapel Hill, N. C., on June 2. He was 72. He served in the 101st Engineers in the first World War and won a Distinguished Service Medal for action at the front in 1918 and 1919.

Bruce Middlemiss, one of the best-known citizens and mining men of Hibbing, Minn., died on June 15. He was a graduate of the Michigan School of Mines and came to Hibbing in 1908. He was formerly superintendent of the Morton mine, at Hibbing. Later he went to Chile and managed a copper property for the Guggenheim interests. On his return to Hibbing he became connected with the Oliver Iron Mining Co. and was employed by that company at the time of his death.

Kenneth Leith, consulting mining engineer and geologist, Amherst, Va., died June 10 at Lynchburg, Va. He was 40 years old. The son of Dr. and Mrs. C. K. Leith, Madison, Wis., Mr. Leith followed the geological and mining profession of his father. After completing his studies at the University of Wisconsin he engaged in mineral work in South America, Mexico, Central America, and in various districts in the United States. He was for several years geologist for the Vanadium Corporation of America.

▼ ▼ ▼

LETTERS

Mining Branch, WPB, Urges Continued Cooperation of Industry

The Editor:

SPEAKING for the Mining Branch of the War Production Board, I want you to know how much we appreciated the space given my article in the April issue of *Engineering and Mining Journal,* in which I endeavored to stress the vital importance of faster cooperation between mine operators and manufacturers in making advance estimates of the machinery and supplies required for adequate essential mining production the balance of this year.

A word of thanks is also due the number of machinery and equipment concerns who used your columns to urge the importance of each operator estimating and advising them of remaining 1942 needs in their lines. It is of great importance to the war program, as well as to the interest of mine operators and makers of mining machinery, that the operators keep the machinery makers continuously advised of their requirements over the next several months.

Nothing can help our efforts to provide adequate critical materials for essential mining uses more than this industry-wide determination of remaining equipment and supply needs for the balance of this year. Frankly, without such figures it will become increasingly difficult over the months ahead to maintain the top priority status now set up for all essential mining.

Thanks again for your good efforts in our behalf.

WILBUR A. NELSON
Administrator of
Mining Branch

Washington, D. C.

Escape from Sumatra

The Editor:

IN JANUARY OF THIS YEAR I wrote you from Pajacombo, Sumatra, but it is quite possible that the letter was not received. In case this is so, will you please put a personal item in the *E.&M.J.* to the effect that my address is now: 36 Bulkara Road, Bellevue Hill, Sydney, Australia. (*E.&M.J.*,Apr.1942)

I caught the last train from Loeboek Linggau, the end of the railroad in South Sumatra, on Feb. 15, which is the day the Japs entered Palembang, and we picked up three hundred British and Australian troops. These men had been repelling parachute landings for two nights; all were exhausted and many wounded, but the Japs were too busy trying to put out the fires in Palembang to bother about us.

Most of my effects were left behind and lost in the Philippines and nearly all I had with me never got beyond the junction out of Palembang. The next day, traveling from Oosthaven in Sumatra, at Merak, Java, I had an interesting account of what had been done by the United States oil men before they left Palembang.

I was in Batavia a week trying desperately to get away before the storm broke and then spent 13 days getting to Fremantle on an old captured Siamese tramp, which had been riddled with bombs and shrapnel coming out of Singapore. Altogether, I am lucky to be here.

The last *Journal* I have received is the November number. If you have intervening numbers that you can send me it will be greatly appreciated.

G. CHESTERFIELD EVANS

Nonsense About Tin

Editor's Note.—The editorial on this topic in the April issue of *E.&M.J.* brought a number of letters from subscribers. At least one of our correspondents, J. A. Singmaster, of Singmaster & Breyer, New York City, wrote also to Boake Carter, whom we had quoted, and received a reply. Copies of these letters were sent to us, whereupon we wrote to Mr. Carter and received a reply. The correspondence is printed below.

From J. A. Singmaster
To Boake Carter *May 18, 1942*

I was quite shocked to read on the editorial page of the May number of the *Engineering and Mining Journal,* of your grossly inaccurate statement regarding tin deposits in the western part of the United States.

I happen to be in the mining and metallurgical business—hence my characterization of the statement as grossly inaccurate from my personal knowledge.

I have frequently listened to your broadcasts, and in the absence of a statement on your part that you were misinformed on this point, I am wondering how much more misinformation you might possibly be disseminating.

It does seem to me that you owe it to yourself and to the people who listen to you to correct such a statement. Otherwise at least some of your public is going to believe that someone is grossly derelict in not bringing these "rich tin deposits" into production.

From Boake Carter
To J. A. Singmaster *June 1, 1942*

Being acquainted with the low standards of information of the Bureau of Mines and being further acquainted with the evils of the British Tin Cartel which has done its best to "pooh pooh" all reports of investigations of tin deposits in this country, I thank you for your letter of May 18, but I see nothing in it to cause me to change my mind.

Simply because you have a difference of opinion does not make me in gross error nor you a model of piety. The Arizona, Texas and Washington States Mines Bureaus tell different stories, but not one finger has been lifted by the Government to extract tin from Alaska. The story of tin is that same old story of rubber. Too many Americans willing to sell out for foreign control and then, when challenged, try to bluster their way out of responsibility of failure to adequately develop the resources under the control and at the disposal of this great nation.

From H. C. Parmelee
To Boake Carter *June 9, 1942*

In the May number of *Engineering and Mining Journal* I published an editorial, copy of which is inclosed. The item brought letters from a number of our subscribers, at least one of whom also wrote to you. I refer to J. A. Singmaster, who was kind enough to furnish me with copies of the exchange of correspondence with you.

In your letter of June 1 to Mr. Singmaster you referred to the "low standards of information of the Bureau of Mines," and you intimated that the State Bureaus of Mines of Arizona, Texas and Washington "tell different stories" about tin deposits.

I now wish to offer you the use of the columns of *Engineering and Mining Journal* for the purpose of

1. Submitting evidence of "the low standards of information of the Bureau of Mines." I do not mean insignificant errors, but refer to standards that presumably are as low as those you exhibited in your comment about tin.

2. Submitting evidence from any responsible mining officials of the States to which you referred in your article—Colorado, New Mexico, Texas, Washington and Oregon—to the effect that substantial deposits of tin of commercial importance exist in those States.

I shall await your reply with great interest, and shall be glad to communicate it to the mining industry.

From Boake Carter
to H. C. Parmelee *June 11, 1942*

I am not the least bit interested in any phony offer from an officially paid agent of an Industry.

Summary of the

MARKETS

CONTROLS on consumption of non-ferrous metals in non-essential civilian uses were intensified during the last month. Consumption of tin and cadmium in the future will be limited to military and essential civilian needs. Beryllium was placed under full allocation. Quicksilver sold at below ceiling levels throughout the month, indicating that the supply situation is such that producers felt encouraged to book business and play safe, regardless of the maximum. Canadian authorities permitted the settling basis for cobalt ore produced in Canada to rise approximately 10 percent. For cobalt concentrate averaging around 10 percent Co the new basis will be $1.10 per pound of cobalt.

The *E.&M.J.* index of non-ferrous metal prices for June was unchanged at 85.90. A year ago the index stood at 83.48. Metals entering into the price calculation are copper, lead, zinc, tin, silver, aluminum, and nickel.

Confusion existed in many quarters about the Production Requirements Plan (PRP) that was put into operation July 1. With few exceptions, all consumers whose past or anticipated quarterly receipt of metals aggregate $5,000 or more are required to file a PRP application to obtain supplies. Those metals now under full allocation should fall into the new plan without much trouble, it was argued, but items that have been relatively free from distribution problems have been placed on the "Metals List," and this was not known to many in the trade in time to make necessary adjustments. Priorities regulation, under PRP, will be imposed on lead. The position of lead has actually eased in recent months and consumers hoped for relief rather than additional control over distribution of lead products.

Copper production is expanding both in this country and in Latin America. However, the war needs also are growing and civilian consumption is being reduced sharply. So far, over-quota copper has not figured largely in the higher rate of production, but this price feature of the market is expected to exert more influence on operations from now on. Domestic consumers obtained 134,000 tons of copper during May, of which about 30,000 tons was metal contributed by Metals Reserve Co. Deliveries during June and July will be larger. The price situation was unchanged. Domestic consumers obtained copper on the basis of 12c., Connecticut Valley. Foreign copper was imported in volume on the basis of 11.75c., f.a.s. United States ports, or the equivalent of the domestic quotation.

The emergency pool for lead again was set at 15 percent of production. Though

UNITED STATES MARKET

1942 June	Electrolytic Copper—Domestic (a) Refinery	Electrolytic Copper—Export (b) Refinery	Straits Tin New York	Lead—New York	Lead—St. Louis	Zinc St. Louis
1	11.775	11.700	52.000	6.50	6.35	8.25
2	11.775	11.700	52.000	6.50	6.35	8.25
3	11.775	11.700	52.000	6.50	6.35	8.25
4	11.775	11.700	52.000	6.50	6.35	8.25
5	11.775	11.700	52.000	6.50	6.35	8.25
6	11.775	11.700	52.000	6.50	6.35	8.25
8	11.775	11.700	52.000	6.50	6.35	8.25
9	11.775	11.700	52.000	6.50	6.35	8.25
10	11.775	11.700	52.000	6.50	6.35	8.25
11	11.775	11.700	52.100	6.50	6.35	8.25
12	11.775	11.700	52.000	6.50	6.35	8.25
13	11.775	11.700	52.000	6.50	6.35	8.25
15	11.775	11.700	52.000	6.50	6.35	8.25
16	11.775	11.700	52.000	6.50	6.35	8.25
17	11.775	11.700	52.000	6.50	6.35	8.25
18	11.775	11.700	52.000	6.50	6.35	8.25
19	11.775	11.700	52.000	6.50	6.35	8.25
20	11.775	11.700	52.000	6.50	6.35	8.25
22	11.775	11.700	52.000	6.50	6.35	8.25
23	11.775	11.700	52.000	6.50	6.35	8.25
24	11.775	11.700	52.000	6.50	6.35	8.25
25	11.775	11.700	52.000	6.50	6.35	8.25
26	11.775	11.700	52.000	6.50	6.35	8.25
27	11.775	11.700	52.000	6.50	6.35	8.25
29	11.775	11.700	52.000	6.50	6.35	8.25
30	11.775	11.700	52.000	6.50	6.35	8.25
AVERAGES FOR MONTH						
June	11.775	11.700	52.000	6.50	6.35	8.25
AVERAGES FOR WEEK						
June	11.775	11.700	52.000	6.50	6.35	8.25
3	11.775	11.700	52.000	6.50	6.35	8.25
10	11.775	11.700	52.000	6.50	6.35	8.25
17	11.775	11.700	52.000	6.50	6.35	8.25
24	11.775	11.700	52.000	6.50	6.35	8.25
CALENDAR WEEK AVERAGES						
June						
6	11.775	11.700	52.000	6.50	6.35	8.25
13	11.775	11.700	52.000	6.50	6.35	8.25
20	11.775	11.700	52.000	6.50	6.35	8.25
27	11.775	11.700	52.000	6.50	6.35	8.25

SILVER, GOLD AND STERLING EXCHANGE

1942 June	Sterling Exchange "Checks" (Nominal)	Sterling Exchange "90-day demand"	Silver (c) New York	Silver London	Gold London	Gold (d) United States
1	401.000	(f)	35.125	23.500	168s	$35.00
2	401.000	(f)	35.125	23.500	168s	35.00
3	401.000	(f)	35.125	23.500	168s	35.00
4	401.000	(f)	35.125	23.500	168s	35.00
5	401.000	(f)	35.125	23.500	168s	35.00
6	401.000	(f)	(e)	(e)	(e)	35.00
8	401.000	(f)	35.125	23.500	168s	35.00
9	401.000	(f)	35.125	23.500	168s	35.00
10	401.000	(f)	35.125	23.500	168s	35.00
11	401.000	(f)	35.125	23.500	168s	35.00
12	401.000	(f)	35.125	23.500	168s	35.00
13	401.000	(f)	(e)	(e)	(e)	35.00
15	401.000	(f)	35.125	23.500	168s	35.00
16	401.000	(f)	35.125	23.500	168s	35.00
17	401.000	(f)	35.125	23.500	168s	35.00
18	401.000	(f)	35.125	23.500	168s	35.00
19	401.000	(f)	35.125	23.500	168s	35.00
20	401.000	(f)	(e)	(e)	(e)	35.00
22	401.000	(f)	35.125	23.500	168s	35.00
23	401.000	(f)	35.125	23.500	168s	35.00
24	401.000	(f)	35.125	23.500	168s	35.00
25	401.000	(f)	35.125	23.500	168s	35.00
26	401.000	(f)	35.125	23.500	168s	35.00
27	401.000	(f)	(e)	(e)	(e)	35.00
29	401.000	(f)	35.125	23.500	168s	35.00
30	401.000	(f)	35.125	23.500	168s	35.00
AVERAGES FOR MONTH						
June	401.900	.....	35.125	23.500	....	35.00
AVERAGES FOR WEEK						
June						
3	401.000	.....	35.125	.....	....	.....
10	401.000	.....	35.125	.....	....	.....
17	401.000	.....	35.125	.....	....	.....
24	401.000	.....	35.125	.....	....	.....

Calendar week averages, New York Silver: June 6th, 35.125; 13th, 35.125; 20th, 35.125; 27th, 35.125.
(e) Not quoted (Saturday). (f) No quotations.

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis, as noted. All prices are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.225c. per pound, the average differential for freight and delivery charges.

(b) Export prices are net at refineries on the Atlantic seaboard and include sales of domestic copper in the foreign market. Owing to the World War and the disruption of normal trade relations, our export copper quotations, since September, 1939, have been based largely on f.a.s. transactions, ex United States ports. We deduct .05c. from the f.a.s. basis (lighterage, etc.) to arrive at the f.o.b. refinery quotation.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingot bars; cathodes are sold at a discount of 0.125c.

Quotations for zinc are for ordinary Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered in the East and Middle West in nearly all instances command a premium of 1c per pound over the current market for Prime Western but not less than 1c over the *Engineering and Mining Journal's* average quotation for Prime Western for the previous month.

Quotations for lead reflect prices obtained for common lead, and do not include grades on which a premium is asked.

(c) Silver other than newly-mined domestic, by Handy & Harman. Under Treasury order of July 6, 1939, the price on domestic newly-mined silver mined subsequent to July 1, 1939, was fixed at 71.11c per troy ounce. Handy & Harman's quotation on newly-mined domestic silver, 999 fine was 70⅝c. throughout June.

(d) U. S. Treasury's gold price. Actual payment by the United States Treasury for gold in domestic and imported ore or concentrate is at 99.75 per cent of the price quoted by the Treasury, which at present is equal to $34.9125.

little need exists for the pool, the authorities in Washington are said to be playing safe and the plan is being continued. Imports of lead have been large.

The allocation plan for zinc is working smoothly. As in copper, consumers were notified well in advance on the tonnages that will be allotted to them during the month. Call for High Grade zinc remains urgent.

Electrolytic tin is being produced in the United States on a moderate scale and OPA has amended the price schedule to permit the sale of this metal on the Grade "A" basis of 52c. a pound. Members of the tin trade were informed officially that their offer to assist in the job of marketing tin under war conditions could not be accepted.

•

LONDON TIN—Trading in Standard tin in London remained suspended throughout June.

OFFICIAL LONDON PRICES—COPPER, LEAD, ZINC

Following are the maximum prices of copper, lead, and zinc established by the Ministry of Supply for the British market, in effect since Dec. 18, 1939:

	Per £	Long Ton s.	d.
COPPER:			
Electrolytic, high conductivity	62	0	0
Fire refined, high conductivity	62	0	0
Fire refined, high grade	61	10	0
Fire refined, min. 99.7 percent	61	0	0
Fire refined, min. 99.2 percent	60	10	0
Hot rolled black wire rods	65	10	0
LEAD:			
Soft foreign, duty paid	25	0	0
Soft, Empire	25	0	0
English refined	26	10	0
ZINC:			
Foreign (G.o.b.), duty paid	25	15	0
Domestic (G.o.b.)	26	10	0
Prime Western and debased	26	10	0
Refined and electrolytic	27	5	0
Minimum 99.99 percent	28	15	0

Quotations are for metal delivered to the consumer.

E & M J PRICE INDEX

Weighted index of non-ferrous metal prices. The average for the years 1922-1923-1924 equals 100.

1929	110.33	1935	74.66
1930	82.87	1936	73.45
1931	60.20	1937	90.86
1932	48.26	1938	73.67
1933	59.79	1939	77.71
1934	69.59	1940	79.22
	1941	83.49	

	1940	1941	1942
January	80.85	82.48	85.39
February	77.23	82.76	85.90
March	77.94	83.27	85.90
April	77.19	83.48	85.90
May	77.68	83.51	85.90
June	78.85	83.48	85.90
July	76.72	83.60	....
August	76.71	83.39	....
September	79.40	83.34	....
October	82.49	83.84	....
November	83.14	84.32	....
December	82.42	84.42	....

CURRENT PRICES — MISCELLANEOUS METALS, ORES, AND NON-METALLIC MINERALS

Quotations cover wholesale lots, prompt shipment, f.o.b. New York, unless otherwise stated

(July 1, 1942)

MISCELLANEOUS METALS

Aluminum, ingot, 99 plus per cent, lb. — 15c.
Antimony, domestic, spot, lb 5 ton or more — 16.013c.
Bismuth, ton lots, lb — $1.25
Cadmium, commercial sticks, lb. — 90c.
Calcium, lb., ton lots 97 @ 98 per cent — $1.25
Chromium, 97 per cent grade, lb. — 89c.
Cobalt, 97 to 99 per cent, per lb. — $1.50
Nickel, electrolytic cathodes, lb. — 35c.
Magnesium, 99.8 per cent, carloads, lb. — 22½c.
Palladium, troy oz. — $24.00
Platinum, (Official quotation) troy oz. — $36.00
Quicksilver, flask of 76 lb., 100 flasks or more — $194.43@$198.08
Radium, mg. radium content — $25.00@$30.00
Selenium, 99.5 per cent, lb. — $1.75
Silicon, minimum 97 per cent, spot, carloads lb. — 14.75c.
Tellurium, lb. — $1.75
Thallium, 100 lb. or more, lb. — $10.00
Titanium, 96 to 98 per cent, lb. — $5.00

METALLIC ORES

Beryllium Ore, f.o.b. mines, ton — $30.00@$35.00
Chrome Ore, per long ton, f.o.b. cars Atl. ports, dry, 48%
- Cr_2O_3, 2.8 to 1 ratio — $39.00
- Domestic, 45%, 2.5 to 1 ratio (f.o.b. mines) — $40.50

Iron Ore, Lake Superior, Lower Lake ports, long ton:
- Old Range bessemer — $4.75
- Mesabi bessemer — $4.60
- Old Range non-bessemer — $4.60
- Mesabi, non-bessemer — $4.45

Lead (Galena) 80 per cent, Joplin, Mo., ton — $76.54
Manganese Ore, (foreign) c.i.f. U.S. ports, long ton unit of Mn:
- 50 per cent — 66c.
- 48 per cent — 65c.
- 46 per cent — 64c.

Manganese Ore, domestic, 48%, f.o.b. mines, l.t. unit — $1.00
Molybdenum Ore, 90%, per lb. of MoS_2, f.o.b. mines — 45c.
Tungsten Ore, per unit of WO_3
- Chinese, 65 per cent, duty paid — (b) $24.00
- Domestic, 65 per cent and upward — (a) $26.00

Vanadium Ore, per lb. of contained V_2O_5 — 27½c.
Zinc Ore, Prime, 60 per cent concentrate, Joplin, Mo.: per ton — $55.28

(a) Prices at mines, small lots, usually several dollars less. (b) Nominal.

METALLIC COMPOUNDS

Arsenious Oxide (arsenic) lb. — 4c.
Cobalt Oxide, 70 @ 71 per cent, lb. — $1.84
Copper Sulphate, 100 lb. — $5.15
Sodium Nitrate, ex vessel, in 200-lb. bags, per 100 lb. — $1.43
Sodium Sulphate, bulk, ton — $18.00@$24.00

ALLOYS

Beryllium Copper, master alloy, 2.5 to 3 per cent Be, per lb. of contained Be — $15.00
Ferrochrome, 65 @ 70 per cent chromium, 4 @ 6 per cent carbon, per pound of Cr contained — 13c.
Ferromanganese, 78 @ 82 per cent, gross ton — $135.00
Ferromolybdenum 55 @ 65 per cent Mo. lb. of Mo. contained — 95c.
Ferrosilicon, 50 percent, gross ton — $74.50
Ferrotungsten, 75 @ 80 per cent, lb. of W contained — $1.90
Ferrovanadium, per lb. of V, delivered — $2.70@$2.90

NON-METALLIC MINERALS

Asbestos, f.o.b. Canadian (Quebec) mines (U.S. funds). ton;
- Crude No. 1 — $650@$750
- Crude No. 2 — $165@$385
- Spinning fibers — $124@$233
- Paper stock — $44@$49.50
- Shorts — $14.50@$26.50
- Vermont, f.o.b. Hyde Park:
- Shingle stock — $62.50@$65.50
- Paper stock — $44.00@$53.00
- Shorts — $14.50@$28.50
- Floats — $19.50

Barytes, long ton:
- Georgia, crude — $9.00
- Missouri, 93 per cent $BaSO_4$, less than 1 per cent iron — $6.75@$7.25

Bauxite, long ton:
- Domestic, crude, 50 @ 52 percent (not dried) — $5.00
- Domestic, chemical, 55 @ 58 per cent — $7.50@$8.50
- Domestic, abrasive, 80 @ 84 per cent — $16.00

China Clay, f.o.b. mines, ton:
- South Carolina and Georgia, No. 1, bulk — $6.75@$8.00
- Delaware, No. 1 — $15.00

Feldspar, bulk, ton:
- Potash feldspar, 200 mesh — $17.00
- Glass-spar, white, 20 mesh — $11.75

Fluorspar, f.o.b. mines, bulk, Kentucky and Illinois 85-5 per cent, all rail movement, ton — $25.00
- Ground, 95 @ 98 percent, bulk, ton — $34.00
- Acid, 98 and 1 percent, bulk, ton — $35.00

Fuller's earth, f.o.b. Georgia or Florida, ton — $7.00@$14.00
Magnesite, per ton:
- Dead-burned, f.o.b. Washington — $22.00

Mica, per lb., North Carolina, No. 1 and 2 quality:
- 1½ x 2 in. — 45@65c.
- 2 x 2 in. — 60@85c.
- 3 x 3 in. — $1.85@$2.05
- 3 x 4 in. — $2.15@$2.25
- 3 x 5 in. — $2.50@$2.75
- White, ground, 70 mesh, ton — $60.00@$80.00

Ocher, Georgia, ton — $19.00@$22.00
Pyrites, Spanish, per long ton unit of S, c.i.f. Atlantic ports — (a) 12c
Silica, in bags, 325 mesh, ton — $20.00@$40.00
Sulphur, Texas, mines, long ton — $16.00
Talc, f.o.b. works, ton:
- New York, double air-floated, 325 mesh — $12.00@$15.00
- New Jersey, mineral pulp — $8.50@$10.50
- Vermont, extra white, 200 mesh — $9.50@$10.50

Tripoli, Missouri, ton:
- 40 mesh, cream colored — $14.50
- 200 mesh, cream colored — $26.00

(a) Nominal

IRON AND STEEL

Pig Iron, Valley furnaces, gross ton: Basic — $23.50
Steel, base prices, Pittsburgh:
- Billets, gross ton — $34.00
- Structural shapes, 100 lb. — $2.10
- Bars, 100 lb. — $2.15

Monthly and Yearly

AVERAGE PRICES

SILVER AND STERLING EXCHANGE

	New York		London Spot		Sterling Exchange	
	1941	1942	1941	1942	1941	1942
January	34.750	35.125	23.273	23.500	(a) 402.000	(a) 401.000
February	34.750	35.125	23.341	23.500	(a) 401.864	(a) 401.000
March	34.750	35.125	23.446	23.500	(a) 401.788	(a) 401.000
April	34.750	35.125	23.500	23.494	(a) 401.058	(a) 401.000
May	34.750	35.125	23.457	23.500	(a) 400.981	(a) 401.000
June	34.750	35.125	23.400	23.500	(a) 401.000	(a) 401.000
July	34.750	.....	23.397	.....	(a) 401.000	.....
August	34.750	.....	23.459	.....	(a) 401.000	.....
September	34.750	.....	23.500	.....	(a) 401.000	.....
October	34.750	.....	23.500	.....	(a) 401.000	.....
November	34.772	.....	23.500	.....	(a) 401.000	.....
December	35.125	.....	23.500	.....	(a) 401.000	.....
Year	34.783	.....	23.439	.....	(a) 401.224	.....

New York quotations for silver other than newly-mined domestic, cents per ounce troy, 999 fine. London pence per ounce sterling silver 925 fine. Sterling exchange (pound sterling) in cents. (a) Nominal.

COPPER

	F.O.B. Refinery, Electrolytic			
	Domestic		Export	
	1941	1942	1941	1942
January	11.819	11.775	10.257	11.508
February	11.794	11.775	10.414	11.700
March	11.814	11.775	10.592	11.700
April	11.820	11.775	10.952	11.700
May	11.815	11.775	10.950	11.700
June	11.810	11.775	10.950	11.700
July	11.812	.....	10.950	.....
August	11.778	.....	10.950	.....
September	11.775	.....	11.027	.....
October	11.775	.....	11.367	.....
November	11.775	.....	11.200	.....
December	11.775	.....	11.200	.....
Year	11.797	.....	10.901	.....

New York quotations, cents per pound.

LEAD

	New York		St. Louis	
	1941	1942	1941	1942
January	5.500	6.275	5.350	6.125
February	5.602	6.500	5.452	6.350
March	5.765	6.500	5.613	6.350
April	5.850	6.500	5.700	6.350
May	5.850	6.500	5.700	6.350
June	5.850	6.500	5.700	6.350
July	5.850	.....	5.700	.....
August	5.850	.....	5.700	.....
September	5.850	.....	5.700	.....
October	5.850	.....	5.700	.....
November	5.850	.....	5.700	.....
December	5.850	.....	5.700	.....
Year	5.793	.....	5.643	.....

New York and St. Louis quotations, cents per pound.

TIN

	Straits New York		Standard, Spot London	
	1941	1942	1941	1942
January	50.154	52.000	256.648	(b)
February	51.293	52.000	264.975	(b)
March	52.067	52.000	270.131	(b)
April	51.981	52.000	269.775	(b)
May	52.166	52.000	267.534	(b)
June	52.685	52.000	262.750	(b)
July	53.481	.....	258.272	.....
August	52.385	.....	257.013	.....
September	52.000	.....	256.364	.....
October	52.000	.....	255.842	.....
November	52.000	.....	256.713	.....
December	52.000	.....	(a) 257.625	.....
Year	52.018	.....	261.137	.....

New York quotations, cents per pound. London, pounds sterling per long ton. (a) Average of 6 days; quotations suspended Dec. 9. (b) Not quoted.

ZINC

	St. Louis			
	1939	1940	1941	1942
January	4.500	5.644	7.250	8.250
February	4.500	5.534	7.250	8.250
March	4.500	5.750	7.250	8.250
April	4.500	5.750	7.250	8.250
May	4.500	5.803	7.250	8.250
June	4.500	6.235	7.250	8.250
July	4.516	6.250	7.250	.....
August	4.719	6.389	7.250	.....
September	6.104	6.920	7.250	.....
October	6.500	7.250	7.942	.....
November	6.500	7.250	8.250	.....
December	5.980	7.250	8.250	.....
Year	5.110	6.335	7.474	.....

St. Louis quotations, Prime Western, cents per pound.

CADMIUM AND ALUMINUM

	Cadmium		Aluminum	
	1941	1942	1941	1942
	(a)	(a)		
January	80.000	90.000	17.000	15.000
February	82.273	90.000	17.000	15.000
March	89.038	90.000	17.000	15.000
April	90.000	90.000	17.000	15.000
May	90.000	90.000	17.000	15.000
June	90.000	90.000	17.000	15.000
July	90.000	.....	17.000	.....
August	90.000	.....	17.000	.....
September	90.000	.....	17.000	.....
October	90.000	.....	15.000	.....
November	90.000	.....	15.000	.....
December	90.000	.....	15.000	.....
Year	88.443	.....	16.500	.....

Aluminum in cents per pound, 99 plus per cent grade. Cadmium, cents per pound. (a) Producers' price, commercial sticks.

ANTIMONY, QUICKSILVER, AND PLATINUM

	Antimony (a) New York		Quicksilver (b) New York		Platinum (c) New York	
	1941	1942	1941	1942	1941	1942
January	14.000	14.000	165.846	202.519	36.000	36.000
February	14.000	14.000	170.182	197.272	36.000	36.000
March	14.000	14.602	177.692	197.050	36.000	36.000
April	14.000	15.991	180.077	197.098	36.000	36.000
May	14.000	16.013	180.000	197.300	36.000	36.000
June	14.000	16.013	183.920	194.282	36.000	36.000
July	14.000	.....	188.577	.....	36.000	.....
August	14.000	.....	192.000	.....	36.000	.....
September	14.000	.....	192.440	.....	36.000	.....
October	14.000	.....	193.615	.....	36.000	.....
November	14.000	.....	196.273	.....	36.000	.....
December	14.000	.....	199.654	.....	36.000	.....
Year	14.000	.....	185.023	.....	36.000	.....

(a) Antimony, cents per pound, ordinary brands, in cases; in bulk f.o.b. Laredo, Tex., 14.500 for June; New York equivalent 15.480. (b) Quicksilver, dollars per flask of 76 lb! (c) Platinum, per ounce troy.

PIG IRON

	Bessemer		Basic		No. 2 Foundry	
	1941	1942	1941	1942	1941	1942
January	24.50	24.50	23.50	23.50	24.00	24.00
February	24.50	24.50	23.50	23.50	24.00	24.00
March	24.50	24.50	23.50	23.50	24.00	24.00
April	24.50	24.50	23.50	23.50	24.00	24.00
May	24.50	24.50	23.50	23.50	24.00	24.00
June	24.50	24.50	23.50	23.50	24.00	24.00
July	24.50	.....	23.50	.....	24.00	.....
August	24.50	.....	23.50	.....	24.00	.....
September	24.50	.....	23.50	.....	24.00	.....
October	24.50	.....	23.50	.....	24.00	.....
November	24.50	.....	23.50	.....	24.00	.....
December	24.50	.....	23.50	.....	24.00	.....
Year	24.50	.....	23.50	.....	24.00	.....

Iron, dollars per long ton. F.o.b. Mahoning and Chenango Valley furnaces.

News OF THE INDUSTRY

Phelps Dodge Accepts WLB Ruling Under Protest

COMMENTING on a directive from the War Labor Board to submit to a "maintenance of membership" clause in agreements with unions with which the company had been unable to reach an agreement, Louis S. Cates, president of Phelps Dodge Corp., said that the company would comply only because of its belief that a refusal to obey might prejudice the country's war effort.

"We think it important that the meaning of the decision of the War Labor Board be understood. Under the 'maintenance of membership' clause laid down by the board, each employee who on July 13, 1942, is a member in good standing of one of the unions involved, or who thereafter becomes a member, must remain a member in good standing for the life of the agreement, as a condition of his employment; that is, if he thereafter ceases to be a member in good standing, the company must discharge him."

Reviewing the negotiations between the corporation and both the A. F. of L. and C.I.O. unions prior to the certification of the cases to the War Labor Board, Mr. Cates said that these negotiations left only three points at issue—wages, vacations, and so-called "union security." A settlement might have been reached before the board's mediation panel on the matters of wages and vacations, he indicated, but the negotiations in Washington broke down because "of the unwillingness of the corporation voluntarily to surrender the principle of freedom of the worker to abstain from membership in, or resign from, any particular union."

U. S. Smelting Will Build New Mill in New Mexico

THE United States Smelting, Refining & Mining Co. will build a completely new 250-ton zinc-lead concentrator on its property at Bayard, N. M. Contract for design and construction has been let to the Western-Knapp Engineering Co., of San Francisco. Construction will begin prior to July 1, and the mill is expected to be in operation about Nov. 15.

WPB Establishes Foreign Requirements Branch

THE War Production Board has announced the formation of a Foreign Requirements Branch in the Bureau of Priorities, with Fred Lavis, Jr., of Mt. Kisco, N. Y., as chief. Duties of the new agency will be to study the requirements of foreign countries which depend on the United States for equipment and supplies, in order that these needs can be correlated with the system of priorities now in use in this country; also to handle the applications of foreign countries and foreign producers for preference ratings.

Metallurgists & Chemists Sought by Government

THE U. S. Civil Service Commission is urgently seeking metallurgists and chemists for employment in various branches of the government. Metallurgists will be used principally in the Bureau of Mines. Requirements for the $2,600 per year grades are a four year college course (bachelor's degree) in metallurgy, chemistry, or closely allied subjects and two years of professional experience, graduate study, or college teaching in metallurgy or chemistry. Salaries for higher grades range up to $5,600, qualifications being based on experience. There is no maximum age limit. Both men and women are eligible. Application forms may be obtained from local postoffices or from the U. S. Civil Service Commission, Washington, D. C.

Government to Make Small Mine Loans

THE Reconstruction Finance Corp. has adopted a program intended to increase further the production of strategic and critical minerals.

Under this new plan, the RFC will make loans not to exceed $5,000 to any one borrower for the purpose of financing the unwatering, retimbering, making accessible, or other preliminary development of mine workings, when in the opinion of the RFC it reasonably appears that the expenditure may make accessible or reveal sufficient mineral showings to warrant a development mining loan.

Anaconda Labor-Management Committees Meet

ON JUNE 11, at the Finlen Hotel, in Butte, Mont., previously formed labor and management committees of the Butte, Anaconda, East Helena, and Great Falls operations of the Anaconda Copper Mining Co. met with government representatives. The government was represented by Frank Ayer, assistant chief of the Copper Branch of WPB; Bela Low, Labor Production Division of WPB; Herbert Heasley, labor consultant of WPB; and Allen Buchanan, Labor Advisory Section of WPB. Several representatives of both A. F. of L. and CIO groups of unions were also present. Proceedings of the meeting were not publicized, but Ayer and Heasley expressed themselves as impressed with the serious and patriotic purpose of those in attendance.

Later, on June 13, Butte Miners' Union Day, the War Production Drive was launched for non-ferrous metal mining in a ceremony at Butte. The usual Miners' Day rally was prevented by the decision of the miners to contribute to the war effort by working instead of indulging in their customary holiday. The ceremony was begun by a telephonic address by Donald Nelson, exhorting metal-mine workers to work vigorously and unceasingly to produce the metals vitally needed in the war program. Nelson's address was followed by responses in a similar vein by D. M. Kelly, vice-president in charge of Western operations for the Anaconda company; James F. O'Brien, president of the Metal Trades union (A. F. of L.); and Reid Robinson, president of the International Union of Mine, Mill and Smelter Workers (CIO).

Mining Engineers Included on Critical List

SELECTIVE SERVICE, on June 18, announced a critical list of persons qualified in scientific and specialized fields. The list includes accountants, chemists, chemical engineers, civil engineers, electrical engineers, ventilating engineers, mechanical engineers, mining engineers, metallurgical engineers, mineral technologists, safety engineers, transportation engineers, geophysicists, industrial managers, and personnel administrators.

Critical lists are furnished to local draft boards to aid them in determining those occupations which merit consideration for exemption from selective service on the basis of their necessity to industry in performing its contribution to the war effort.

Organization Created to Purchase and Develop Mica

THE Colonial Mica Corp., with head offices at 92 Liberty St., New York City, has been created to act as agent for Metals Reserve in purchasing "strategic" mica; also to work with mica miners to develop and finance production.

Minimum Grade of Chrome Purchases Lowered

SPECIFICATIONS covering purchases of domestic chrome ore by the Metals Reserve Co. have been lowered. "High Grade" ore is now defined as material containing a minimum of 45 percent of Cr_2O_3, against a minimum of 48 percent in the previous schedule. The base price, posted May 25, 1942, continues at $40.50 per long ton, dry, and the ratio of chrome to iron also continues at 2.5 to 1. In reducing the chrome content, the producer will, for all practical purposes, obtain more money for his product.

Large Sums Expended to Develop Copper

WILLIAM L. BATT, chairman of the Requirements Committee of WPB, stated publicly: "We expect to have this year about 1,800,000 tons of copper from domestic output and imports. Recovery of scrap should add approximately 300,000 tons to our store. . . . Non-essential civilian users cannot expect to obtain any copper, and only a necessary minimum amount will be available for essential non-military use. The Government is spending in excess of $180,000,000 for copper development and private capital has supplied some $40,000,000 more."

Strike Ended, Operations Resumed, at Nacozari

THE STRIKE of mine and mill employees of the Moctezuma Copper Co., Phelps Dodge subsidiary, at Nacozari, Sonora, Mexico, was ended June 19 with an agreement consummated before the Minister of Labor, at Mexico City. Work was resumed at the mine and plants as soon as news of the accord was received. The agreement granted 822 of the workers a daily increase in wages of 42 centavos (equivalent to 9c.), plus a bonus of 25 centavos for each cent addition to the price of copper over a base price of 12.5c. The company also agreed to provide X-ray examinations for all employees. Other points entering into the dispute will be arbitrated by President Avila Camacho.

Perkins Certifies Utah Wage Conference to WLB

ON JUNE 23, Secretary of Labor Frances Perkins certified the labor contract conference between Utah mine operators and the CIO International Union of Mine, Mill and Smelter Workers, to the War Labor Board as a deadlocked industrial dispute. The conference was over renewal of the contracts between the union and operators producing the bulk of Utah's metal-mine output, embracing the activities of 14 plants, employing 4,000 men. Up to the time of certification, the conference had not yet worked out an agreement over the issues of wage rates and union security. None of the workers involved was on strike.

Reflections From Washington

(*Continued from page* 42)

fuel reduction of iron ores to producing sponge iron. Another wartime appropriation gives the Bureau $4,000,000 to drill and equip additional helium wells to meet increasingly urgently demands for this gas.

Announcement has been made of a Resources and Laboratories Service, which will take over the functions of the Mining Metallurgical and Non-Metals divisions which are concurrently abolished. The new setup will have three regional offices: College Park, Md.; Rolla, Mo.; and Salt Lake City, Utah. Also, the Coal, Petroleum, Natural Gas and Explosives divisions are abolished in favor of a new Fuel and Explosives Service. These changes are part of a "streamlining" of the Bureau, announced in connection with the appointment of R. S. Dean as Assistant Director.

Wage-Hour Decision

ON JUNE 8 the Supreme Court handed down its first two decisions involving the Wage-Hour Act. In Overnight Motor Transportation Co. vs. Missel the court sustained the viewpoint of the administrator, but in Walling vs. A. H. Belo it held for the defendant. Both cases involved disputes over the computation of overtime wages. In the Missel case, the transportation company had paid Missel a wage which in all cases exceeded the statutory minimum plus time and a half for overtime, but there had been no contract specifying a normal wage rate. The court decided that the normal wage was the weekly wage divided by the actual number of hours worked that week, and that Missel was entitled to overtime pay on this basis. In the Belo case, the employer had made individual wage contracts with the employees, specifying a normal and an overtime rate of pay, and agreed to pay a guaranteed minimum weekly wage based on a 40-hour week plus several hours of overtime, whether the employee worked the full overtime period or not. In this case the administrator contended that the regular rate should be computed by dividing the weekly wage by the number of hours worked; but the court failed to concur.

Tax Bill Reported

AFTER long and laborious consideration, the Ways and Means Committee completed work on the war tax bill late in June. As sent to the House, the bill is estimated to raise just short of six billion in gross revenue, of which nearly one billion would be repaid to corporations after the war. Thus, the proceeds are considerably less than the Treasury would like to siphon off the national income

(*Continued on page* 102)

ARIZONA

Activity Continues on Upgrade

Promising developments at Cleopatra mine —Ajo adding to capacity—Producers, Inc., shuts down cyanide plant

▶ Producers, Inc., operating a gold cyanide mill near Chloride, Mohave County, has closed down. It had previously been handling custom gold ores, but because of priority troubles, H. W. Thorne, manager, announces that plans are contemplated whereby the crushing equipment of the plant can be used in processing lead and zinc ores. Flotation cells are expected to be added. Lead and zinc ores are plentiful in the area. The company already is making an examination of several base-metal mines with a view to taking them over to supply the mill. The Chloride district has many lead and zinc properties in the Cerbat Mountains, that can be made to produce a large tonnage of base metal ores.

▶ The Manganese Ore Co., a subsidiary of the M. A. Hanna Co., of Cleveland, Ohio, is continuing its extensive diamond-drilling program on the Artillery Peak manganese deposits and expects to have its final report ready early in July. Extensive improvement of roads has already been accomplished to make transportation more economical between the mines and the railroad connection on the main line of the Santa Fe Railroad at Yucca, 24 miles west of Kingman.

▶ Strong and Harris, operating the Cleopatra mine, in the Bill Williams district of southern Mohave County, are hauling approximately 100 tons of copper ore daily from its mine to the railroad station at Yucca. Plans are being made to double the production in the near future. The production is solely an open-pit operation, with power-shovel loading directly into bins or into trucks. The copper ore carries some gold values; also, the lime content of the ore makes it particularly desirable for smelting and thus affords a premium price for the ore. The development work which has been going on for some weeks has disclosed a large tonnage of commercial ore and the mine gives promise of becoming a steady producer.

▶ N. A. Wimer, 70 Pine St., New York City, president of the Tennessee-Schuylkill Co., which operates the Tennessee mine, at Chloride, has been spending considerable time in Mohave County looking after the affairs of the company. Because of labor shortage the company has been forced to cut down its daily production of concentrates. An effort is being made to relieve the labor situation so that the company may increase its output of critical metal ores over past records, which have been as high as 1,500 tons of lead and zinc concentrates monthly. The company produces about equal amounts of lead and zinc concentrates. The higher scale of wages paid in many defense industries causes miners to leave for more highly paid positions, although the usual scale of wages is paid at the mines.

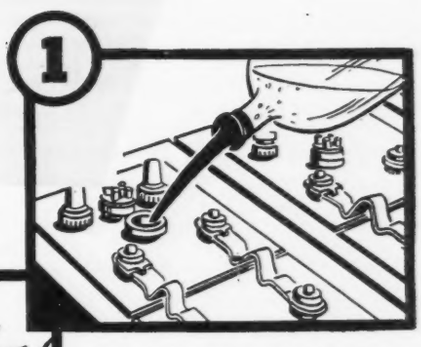
SAVE TO WIN

EVERY storage battery is a war weapon, containing metals vital to our fighting men. You hold these metals in a sacred trust. It's your duty to squeeze from them every ounce of use . . . by following simple rules for battery conservation.

HERE'S HOW TO MAKE YOUR BATTERIES LAST!*

Keep the top of the battery and battery container clean and dry at all times. This will assure maximum protection of the inner-workings.

Keep the battery fully charged—but avoid excessive overcharge. There's always a right-way to do any job, and a storage battery will last longer when charged at its proper voltage.



Keep adding approved water at regular intervals. Most kinds of local water are safe in an Exide Battery. Ask us if yours is safe.

Keep records of water additions, voltage and gravity readings. Don't trust your memory. Write down a complete record of your battery's life history. Compare readings. Know what's happening!

Exide IRONCLAD BATTERIES

*** If you wish more detailed information, or have a special battery problem, don't hesitate to write to Exide. We want you to get the long-life built into every Exide Battery. Ask for booklet Form 1982.**

THE ELECTRIC STORAGE BATTERY CO., Philadelphia
The World's Largest Manufacturers of Storage Batteries for Every Purpose
Exide Batteries of Canada, Limited, Toronto

▶ARIZONA

▶ Gladiator Mining Co., Crown King, Ariz., has taken over the mill of the Golden Belt Mines, Inc., at Cordes, and is putting the plant in condition to treat the ores from the Gladiator mine. E. M. Moores, of Crown King, is president of the company. Values are in gold, silver, copper, lead, and zinc.

▶ The Culver-Murphy Company, headed by Harry H. Culver, of Phoenix, has opened tungsten properties in the Dragoon Mountains, the ore of which is running particularly high in hubnerite. The company is applying for a federal loan and expects to make a large production. The ground formerly belonged to J. J. Wein, of Benson, Ariz., and is about 13 miles west of Benson. Pockets of high grade ore have been found.

▶ The old Wrigley property, in the Stockton Hill country, has recently been taken over by California mining men and development work started. This property in past years made some production of lead and zinc. Plans now are to get into production again as quickly as possible. Mining has already been started under the direction of Pete Vukuoy, an experienced operator of this section. Ore bins are being built preparatory to making shipments.

▶ Arizona Magma Mining Co., of Chloride, which has been idle for some months, has turned its property to Nelson Brothers, California gold mine operators, who are planning to resume operations of the mine. The ore carries gold, silver, and lead. A 75-ton flotation mill is on the property and can be quickly put in operation. The mine is developed by a shaft 500 ft. deep and several thousand feet of drifts and stopes. It is said that there are large tonnages of commercial ore blocked out.

▶ J. W. Still, general manager of the Bagdad Copper Corp., near Hillside, has acquired for his company all of the Cofer interests in the immediate district. This property was formerly owned by the Burro Creek Cattle Co. Bagdad Copper is now carrying on an intensive development program, which is financed by a $2,500,000 loan from the RFC.

▶ The Phelps Dodge Corp.'s, New Cornelia plant, at Ajo, is having its daily production of 22,500 tons stepped up to 25,000 tons. H. M. Lavender, of Douglas, is general manager at Ajo. This increase will amount to about 6,000 tons of copper annually.

▶ A large loan is reported to have been made to the Boulder Mining Co., of Hillside, Ariz., for development purposes. The mine and the 100-ton flotation mill have been closed down since the first of the year. Meanwhile, the mine has been kept free of water. Plans are said to contemplate doubling the capacity of the present mill.

▶ A. J. Freericks and associates, of Los Angeles, Calif., have leased the Sheba mine, near Wenden, and are already mining and shipping copper ore. The mine is well equipped with machinery and future plans include the installation of milling facilities. The mine is owned by Mrs. Ida Macauley, of Phoenix, Ariz.

Federal Bureau of Mines

Diamond drilling unit employed to explore manganese deposits in the Artillery Peak district, Arizona

MONTANA

Extensive Chromite and Manganese Activity

Production expanding in Stillwater Complex —Milling ore being purchased at Philipsburg—Many new operations at Butte

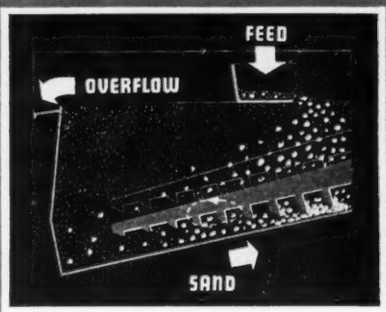
▶ Development work, construction, and mining are proceeding rapidly and with considerable success in the chromite deposits of the Stillwater complex in Stillwater and Sweet Grass counties. With the exception of some relatively insignificant production during World War I, chromite mining is a new industry for Montana. Consequently, development along the 20-mile length of chromite deposits in the Stillwater complex is being watched by Montana mining men with considerable interest.

▶ Anaconda Copper Mining Co., operating under a management agreement with the Defense Plant Corp., is milling 350 tons of chromite ore daily from the Benbow mine. Ore is transported from mine to mill by an aërial tramway. Gravity methods employing shaking tables are used to produce a chromite concentrate from the ore. The concentrates are hauled by truck to the railroad at Columbus, 35 miles away. A recent radio news broadcast stated that money has been allocated by the federal government for immediate improvement of this truck road. Fred Gaethke is in charge of the chromite mining operation for the A.C.M. company. His headquarters are in Columbus.

▶ Chromite ore is being blocked out in the extensive deposits on the Mouat property, west of the Stillwater River in Stillwater County. Preparations for mining and concentrating this ore are being rushed by Anaconda. Mine and mill buildings are under construction.

▶ Thirty-five men are employed developing the chromite deposits at the western end of the Stillwater complex, 35 miles south of Big Timber in Sweet Grass County. Two adit tunnels are being driven in the orebody on the Gish prop-

CONTROLLED AGITATION



Controlled Agitation, **an exclusive Dorr principle, is the opposite of "quiescent pool" classification, where the point of separation is governed solely by the slope of the tank and the dilution of the pulp.**

Controlled Agitation, **provided by Dorr's patented Tapered Rake Blades, may be mild or intense, depending upon the separation. It supplements the two other minor factors—slope and dilution —to give a flexibility and control unequaled elsewhere.**

Pulsations set up in the pulp pool cause the particles to stratify horizontally—the fines at the top, the coarse at the bottom. A jigging action imparted to the sand bed aids in the release of entrained undersize.

Result: less oversize in the overflow, less undersize in the sand, less overgrinding in the ball mill. In short, better metallurgy because of a better prepared feed to flotation and cyanidation.

★

This advertisement is one of the following series of six on "Better Metallurgy Through Better Classification," covering some often overlooked factors in classification practice:

1. Controlled Agitation.
2. Mechanical Principles and Operating Costs.
3. Capacity per foot of width.
4. Tank Slope and the All-Gravity Closed Circuit.
5. Starting up after a power outage.
6. Flexibility under changing conditions.

Reprints of previous ads in this series will gladly be sent you on request.

ONE OF A SERIES ON BETTER METALLURGY THROUGH BETTER CLASSIFICATION

THIS MATTER OF CAPACITIES PER FOOT OF WIDTH!

VISITOR

I've been trying to figure out classifier sizes for our plant expansion using those "tons per foot of width" figures we hear about.

Is that a good way to go about it—are those capacities per foot reliable?

MILL "SUPER"

No, I'm afraid you are going off on the wrong slant and asking for trouble.

*

Why So?

You can only compare classifiers on a "tons per foot" basis under identical conditions—same ball mills, same ball mill feed, same ore, same mesh of overflow, percent solids and circulating load.

Tons per foot of width mean absolutely nothing as a general statement, applicable to all conditions.

Classification capacity is and must be a function of grinding capacity and ore characteristic. You can't classify any more than you can grind.

*

I'm beginning to see. Perhaps you have a practical example.

Yes, I have just that. I have seen two 16 ft. Dorrs in circuit with identical mills—one overflowing 550 tons per day of 2% plus 100 mesh and the other 1600 tons per day of 1% plus 100 mesh.

Both classifiers were doing good jobs under their own particular conditions.

Now look at your "tons per foot of width" ratios—35 tons per foot for one against 100 tons per foot for the other. They just don't mean a thing you see.

*

Yes, I see what you are driving at. Have you any more figures on Dorr overflow and raking capacities under different conditions?

Yes, I have. Here are some from my notebook.

			Fines Overflowed		Sands Raked	
Plant*	Class. Width	Separation	Tons Per day	Tons Per ft./day	Tons Per day	Tons Per ft./day
A	12 ft.	3%+ 20M	1350	112	10,400	867
B	7 ft.	3%+ 20M	3529	505	6,000	857
C	12 ft.	5%+ 48M	1450	120	6,500	540
D	7 ft.	1%+ 65M	550	78	3,200	457
E	12 ft.	1%+100M	1000	82	4,000	333

*Names and locations on request.

*

I see there is a lot more to this matter of capacity than I thought. How would you sum it up?

Don't be misled by general statements on so-called "tons per foot of width" which mean next to nothing.

Call in an experienced Dorr engineer—let him do the figuring for you—let him show you what you should use and what you should get under your own plant conditions.

DORR

RESEARCH ENGINEERING EQUIPMENT

DORRCO

THE DORR COMPANY, INC., ENGINEERS

NEW YORK, N. Y. . . . 570 LEXINGTON AVE.
ATLANTA, GA. . . . CANDLER BUILDING
TORONTO, ONT. . . . 80 RICHMOND ST.W.
CHICAGO, ILL. . . . . 221 NO. LA SALLE ST.
DENVER, COLO. . . . . COOPER BUILDING
LOS ANGELES, CAL. . . . 811 WEST 7TH ST.

RESEARCH AND TESTING LABORATORIES
WESTPORT, CONN.

SUGAR PROCESSING
PETREE & DORR ENGINEERS, INC.
570 LEXINGTON AVE., NEW YORK

ADDRESS ALL INQUIRIES TO OUR NEAREST OFFICE

A Ball Mill Manufacturer's Views on the *Comparative Values of Liner Metals*

"From our own observations and the experience gained through many years of operating and building ball mills, we consider that 13% manganese steel is from two to three times as durable as any other metal for ball mill liners operating under normal conditions with mixed ball charges of sizes from 1½" to 4" or even larger. This comparison includes chilled iron, alloy irons, carbon steel and other alloy steels.

"In actual service a 1½" manganese steel liner can be worn down to ½" thickness or even less before it has to be discarded. We have specimens of manganese steel liners in our shop that were worn down to ⅛" thickness without any sign of cracking or breaking. On the other hand, 3½" thick white iron liners have had to be discarded when worn down to 1½" because of breakage which often causes severe damage to the shell of the mill itself unless quickly discovered by the operator."

The writer goes on to state that the thinner the liner can be, the greater the efficiency of the ball mill, by virtue of the increased inside diameter. A mill with white iron liners 44" diameter, grinding 25 tons in 24 hours, could produce 30 tons in the same period if manganese steel liners were used, increasing the diameter to 48".

He also points out the savings in freight, whether the liners are original equipment or for replacement, since a set of manganese steel liners for a No. 44 mill, for example, weighs approximately 3,300 pounds compared to white iron or similar liners weighing 6,700 pounds. Too, the lighter weight liners are obviously easier to fit to the mill and shorter and less costly bolts are required. There is no danger of breaking manganese steel liners by uneven tightening of retaining bolts.

A greater variation in liner designs is possible with manganese steel, because of its strength and ductility, than with white iron and other hard, relatively brittle metals.

These factual comparisons are extracted from the more detailed report of this particular manufacturer contained in our Bulletin 1141-L. It gives other information concerning manganese steel liners, discusses liner design and pictures representative shipments, and will be sent on request.

One of many designs of manganese steel liners—a typical shipment.

Amsco

AMERICAN MANGANESE STEEL DIVISION
OF THE AMERICAN BRAKE SHOE & FOUNDRY CO.
Chicago Heights, Illinois

Manganese Steel Castings for shocks and abrasion.
Chromium-Nickel Alloy Castings for heat and corrosion resistance.
Power Shovel Dippers. Dredge and Industrial Pumps.
Welding Materials for reclamation and hard-surfacing.

FOUNDRIES AT CHICAGO HEIGHTS, ILL.; NEW CASTLE, DEL.; DENVER, COLO.; OAKLAND, CALIF.; LOS ANGELES, CALIF.; ST. LOUIS, MO. OFFICES IN PRINCIPAL CITIES

▶MONTANA

erty. Present plans call for a third chromite concentrating mill to be built on the Boulder River if initial development indicates an adequate ore supply.

▶ Porter Brothers Mining Co., of Helena, is reported to be interested in the Mike Horse mine, near Lincoln. Lead-zinc ore from the mine is milled in a 200-ton selective flotation plant. The mill is producing a lead and a zinc concentrate that are shipped to East Helena and Great Falls respectively. Approximately 70 men are employed in the mining and milling operation. The Porter Brothers company is best known for its gold dredging operations in the Helena area.

▶ Work is now in progress towards the construction of a manganese ore beneficiation plant at Philipsburg, Mont. The plant is to be operated by the Sunshine Mining Co., of Big Creek, Idaho. It will be designed to treat manganese oxide ores. Shipments of ore containing 15 percent or more manganese are now being purchased for stockpiling. The Philipsburg district has for many years been the principal source of battery-grade manganese ore in the United States. The battery ore is produced by Moorlight Mining Co., and Trout Mining Co., of Philipsburg. It is expected that much of the manganese ore to be milled by Sunshine Mining will be shipped from mines outside the Philipsburg area.

▶ A number of small leasing operations producing manganese ore are springing up in the Butte district. Similar activity was common in the Butte camp in World War I. At that time, the total production from those small operations contributed substantially to the nation's output of manganese ore. The present crop of lessees plan to sell their output to the Metals Reserve Co. Metals Reserve is buying ore as low-grade as 15 percent manganese content, and is establishing buying agencies in Butte and Philipsburg. The Fredonia, Independent, and Rising Star mining claims are among those now being worked by lessees for near-surface manganese ore.

▶ The U. S. Bureau of Mines is diamond drilling the manganese-bearing veins on the Tzarina claim west of Butte, and adits are being driven into the outcrop to block out manganese ore. The drilling work is in charge of Frank Belina, engineer for the Bureau. The Tzarina claim is under lease to John Cole, Domestic Manganese & Development Co., Butte. This company has a manganese ore treatment plant for the conversion of rhodochrosite to manganese oxide.

▶ United States Vanadium Corp. continues to produce chromite ore from its open cut near the Red Lodge-Cooke City highway on Line Creek plateau. The ore is trucked to Red Lodge, where it is concentrated in a 200-ton-capacity mill. This operation will soon celebrate its first anniversary. United States Vanadium has recently completed several miles of truck road from the Red Lodge-Cooke City highway to Hellroaring plateau. Production from hitherto difficultly accessible and undeveloped deposits of chromite ore on Hellroaring plateau is expected soon.

CALIFORNIA

Emphasis on Strategic Mineral Production

Metals Reserve purchase depots at Auburn and Tracy stimulate manganese and chrome output — Castro Chrome starts production

▶ Search for and development of strategic mineral deposits (chromite, manganese, quicksilver, tungsten) continue throughout the State's mining areas, and gold-mining operations have been reduced by further loss of labor to defense industries and difficulty in obtaining equipment and materials. Government stockpiles and ore-buying depots for war minerals have been established at Auburn, Placer County, and Tracy, San Joaquin County, with additional units scheduled to be opened soon at other points. Several gold-mining operations, including that of the Golden Queen Mining Co., at Mojave, Kern County, are investigating scheelite-bearing areas with a view to installing tungsten recovery plants at their mills. In the Livermore-Tracy area several manganese properties, including the Buckeye and Tip Top, are in operation, making shipments of ore to the government stockpile at Tracy, and responsible San Francisco interests are reported to be investigating the old Ladd manganese mine. Quicksilver output continues high.

▶ Development work has been started at the Aetna quicksilver mine, near Aetna Springs, Napa County, taken over recently by the Basin Montana Tunnel Co., A. A. Ryan, Jr., president. The property consists of five patented claims, and is equipped with a 4x65-ft. rotary furnace with an appropriate condensing system, and a retort. George I. Barnett is in charge of operations.

▶ Plans are maturing for the installation of a treatment plant at the Arambidie quicksilver mine, near Dos Palos, Merced County, now owned and operated by the General Dredging Co., of Sacramento, operators of dragline dredges in the Folsom and Coloma placer areas of the State.

▶ Production has been started at the property of Castro Chrome Associates near San Luis Obispo, following completion of a 100-ton concentrator at Goldtree, a station on the main line of Southern Pacific R. R. The chrome ore is mined by open-pit methods and trucked to the treatment plant, where the grade is raised from 25 percent to 45 percent by concentration. Finished material is sold to Metals Reserve Co. Castro Chrome Associates is controlled by M. C. Milton, D. A. Hall, and associates of San Francisco, with L. E. Putnam, superintendent, directing operations at the mine and concentrator.

▶ About 2,000 cu.yd. of gold-bearing gravel a day is being treated by the dragline dredge unit operated by the Thurman & Wright Dredging Co. near San Andreas, Calaveras County. Thirteen men are employed under the direction of J. Sobrero, superintendent.

UTAH

New Developments in Tintic Area

Construction begun on Monticello vanadium plant—New wage contract conference—Bureau of Mines scrutinizing prospects

▶ Assessed valuation of Utah non-ferrous metal mines for 1942 increased to $118,883,126, a $15,000,000 rise, according to the announcement of J. Lambert Gibson, chairman of the State Tax Commission, State Capitol, Salt Lake City.

▶ Desert Tungsten Co., operating near Eureka, has been one of the first properties to start shipments to the U. S. Vanadium Corp. mill, to be constructed in Salt Lake City.

▶ New work is to be started by the Chief Consolidated Mining Co., Eureka, to unwater and mine large bodies of ore carrying low-grade values in zinc and lead, previously considered unprofitable. The Government recently granted zero quotas, which gives the company the benefit of full premium prices. Pumping is to be started to reach the ore lying below the 1,900-ft., level. General manager Cecil Fitch expects that production of the ore will average 5,000 tons monthly.

▶ Rich ore was recently struck in the main development drift of the Eureka Lilly mine, in the East Tintic mining district.

▶ Production of the National Tunnel and Mines Co. has increased to 400 tons daily of copper ore from its Apex mine, at Bingham. The Rood shaft has been unwatered and cleaned out to the bottom 3,300 level, where development has started. The mine is employing 300 men.

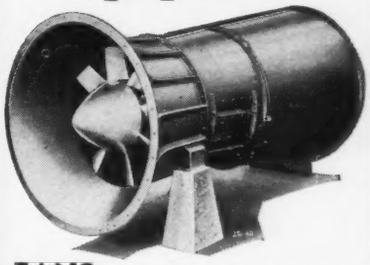
▶ Mine and smelter operators have been carrying on negotiations with representatives of District No. 2, International Union of Mine, Mill and Smelter Workers, relative to a new wage and working conditions contract to replace that expiring June 30, 1942. Eldred M. Royle, member of the State Industrial Commission, is presiding at the sessions. The prevailing wage is now $6.45 a day for miners and $5.95 for muckers.

▶ Stearns-Roger Manufacturing Co., of Denver, has started construction of the new vanadium plant at Monticello for the Vanadium Corp. of America. Ore is now being stockpiled and about 50 homes are being built on the south edge of Monticello, including two lodges for single men. The company may construct an aerial tramway across the San Juan River to facilitate the shipment of Arizona ores now being trucked through Cortez and Shiprock.

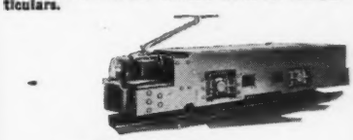
▶ Examination of 30 prospects for copper, lead, and zinc deposits will be carried on by the U. S. Bureau of Mines in Utah, Nevada, and Colorado, reports Paul T. Allsman, senior engineer in charge of the mining division office. Examination of manganese deposits is being made in the Simpson Mountains, Death Canyon, 40 miles west of Eureka, and of iron deposits at Bull Valley, Washington County.

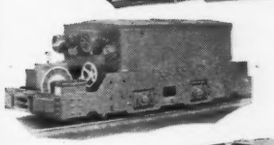
JEFFREY •

the ultimate in modern mine equipment

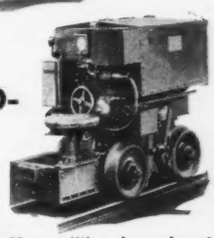


FANS Jeffrey offers complete engineering and service facilities for coal and metal mine ventilation from the small truck mine to the modern fully mechanized mine. Jeffrey equipment includes a full range from the Aerodyne Midget up to the Aerodyne fan with an output of 500,000 cu. ft. per minute. Write for full particulars.

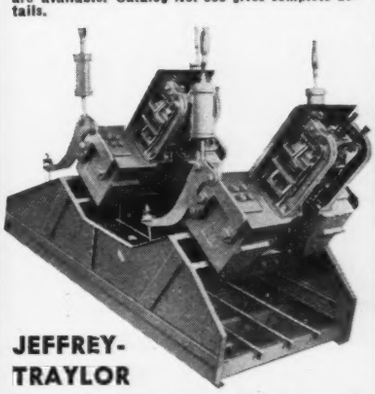




MINE LOCOMOTIVES



From heavy duty main line haulage to small trammers, Jeffrey has a type, size and track gauge to meet your specific condition in coal and metal mining. Trolley, cable reel, storage battery and combination trolley and storage battery units are available. Catalog No. 555 gives complete details.



JEFFREY-TRAYLOR

Electric Vibrating Equipment

Precision units for handling all classes of material are included in J-T screens, feeders, waytrols, conveyors, dryers and coolers. Capacities vary from a few ounces to several tons per hour. Nothing to wear out or lubricate—no mechanical adjustments necessary. Write for full descriptive literature on J-T units.

THE JEFFREY MANUFACTURING CO.

COLUMBUS OHIO, U.S.A.

You can depend on Willson Safety Devices. They are designed and tested in one of the largest and best equipped laboratories of its kind in the world.

For dependable protection consult your local Willson Representative on all your Industrial Goggle and Respirator problems.

GOGGLES • RESPIRATORS • GAS MASKS • HELMETS

DOUBLE WILLSON

PRODUCTS INCORPORATED

READING, PA., U.S.A. *Established 1870*

NEVADA

Production of Strategic Minerals on Increase

New mercury operation in Antelope Flat—Gold & Silver Circle bankruptcy sale—Three Kids construction well under way

▶ A new 50-ton rotary furnace is in operation at the Silver Cloud cinnabar mine, in Antelope Flat, western Elko County, acquired several months ago by the newly formed New Verde Mines Co., which is reported to be a subsidiary of Newmont Mining Corp. Development had been conducted for more than a year by J. T. Maddeford, of Ely, and associates. In charge is Bryan R. Frisbie, formerly with Berens River Mines, Ltd., a Newmont subsidiary with a gold-silver property and 225-ton cyanide mill at Favourable Lake, Ontario.

▶ Trucking contractors are transporting salt in large volume from deposits in Death Valley to the main plant of the Basic Magnesium, Inc., under construction near Boulder dam. Power lines have been completed, well ahead of schedule, to this plant from the Boulder dam generators and to the Gabbs Valley magnesite deposits and calcining plant, 350 miles to the north. The latter line extends from Millers, Nye County. The 12-mile water supply system from Lake Mead to the main plant, with reservoirs of 30,000,000-gal. capacity, was completed in April. Managers at both plants complain of a shortage of labor.

▶ Manganese deposits 15 miles north of Tonopah, in Nye County, found in late months by E. M. Booth, successful Tonopah prospector, have been acquired under option by unidentified New York men whose engineer, after some surface sampling, said a large volume of ore of workable grade was indicated. The optionees, he said, were starting development and considering early construction of a 300-ton concentrator.

▶ The Natomas Co. has completed assembly of a Bucyrus-Monighan dragline with 6-cu.yd. bucket and floating washer, rated at 120,000 cu.yd. per month, on placer ground below Copper Canyon, Lander County, leased from James O. Greenan, of Reno. C. E. McKay, Battle Mountain, who has been dredge foreman for the Natomas-operated Manhattan Gold Dredging Co., is in charge. It is the purpose later to operate a bucket-line dredge, possibly the Manhattan dredge, on the flat alluvial fan below the canyon outlet.

▶ Properties of the bankrupt Gold & Silver Circle Mines, Inc., at Midas, Elko County, are being sold at sheriff's sale to satisfy creditors' claims aggregating over $125,000. The largest claim, for $101,400 and accrued interest, plus fees and costs of some $25,000, is that of the estate of the late Charles Hayden, of Hayden, Stone & Co. Included are the Elko Prince, Reco, Colorado Grande, Missing Link, Rex, and Jackson mines, former gold producers of note; a well-equipped 75-ton cyanide mill; many buildings, compressors, and a large quantity of mine equipment. Claude W. Touzeau, of Midas, president and manager, has been made receiver in federal bankruptcy.

▶ Main-shaft workings of the Buck & Charley mine, at Lower Rochester, Pershing County, are being unwatered for the purpose of mining lead-zinc ore that was exposed on the 200 and 300-ft. levels several years ago when the mine was operated by the Rochester-Plymouth Mines Co. It supplied gold-silver ore for a 60-ton flotation mill built by that company, later adjudged bankrupt. The property is said to have been acquired several months ago by John T. Butler, of Pittsburgh, Pa. Kent Maher, of Rochester, via Lovelock, is in charge and indicated that the new owner will resume milling.

▶ In the old Bernice antimony district, in Churchill County, Clyde W. Larkin, of Fallon, has produced lately several carloads of high-grade antimony ore, purchased by Fred H. Dakin, ore buyer for the Texas Mining & Smelting Co. at Laredo, Tex. Dakin has bought and shipped antimony ore also from the Winnie Quartz mine, at Gold Creek, owned by N. L. McKinnon, of Reno; the Fencemaker mine of Alma Dorothy Priester, in Pershing County, and from claims in the Ten-Mile district, Humboldt County, worked by Sam Watkins and Carl Stolfelt. An oxidizing furnace has been provided at the Bloody Canyon antimony mine in the Star district, Pershing County, formerly the State's largest producer.

▶ A 50-ton scheelite concentrator is operated by Ben Edwards and Jack Warner on ore from the adjoining Gunsight and Desert Scheelite mines in the Pilot Range, 20 miles east of Mina, rail and mail point, in Mineral County. Both properties were productive during the last war period. Concentrate, said to be of high grade, is shipped by truck to the 1,300-ton plant of the U. S. Vanadium Corp., on Pine Creek, west of Bishop, Calif.

▶ At the Three Kids property, the Manganese Ore Co., agent for Defense Plant Corp., has completed construction of mine plant buildings, and equipment already in operation is now moving from 150,000 to 200,000 cu.yd. of overburden per month from the area to be mined by open-pit methods. At the mine construction is under way on ten houses and one bunk house, and at the plant site 60 houses, two bunkhouses, a dining hall, and a recreation building are going up. A spur line from Royson, Nev., to the property is nearing completion, and an 8-mile paved highway will be built in co-operation with the State Highway Commission of Nevada. Water for the camp and plant will be taken from the 40-in. pipe line running from Lake Mead to the property of Basic Magnesium Corp. Electric power is taken from the power line completed recently by Southern Nevada Power Co. Grading for the treatment plant has commenced, with construction of buildings and erection of machinery to follow immediately. Officers of the company include Geo. M. Humphrey, president; H. L. Pierce, vice president; M. C. Lake, vice president; and W. A. Maier, secretary-treasurer. Operations at the mine are directed by J. H. Reeder, superintendent. Manganese Ore Co. has subcontracted construction of the plant to P. J. Walker Co. of Los Angeles.

IDAHO

Bunker Hill Remodels Kellogg Concentrator

Bureau of Mines will investigate clay deposits—Highland Surprise, Clayton Silver and Victory Metals now shipping

▶ Bunker Hill & Sullivan Mining & Concentrating Co. has plans perfected for remodeling all of its big concentrating plants at Kellogg, and construction operations are now well under way, according to J. B. Haffner, resident manager. Remodeling operations are under the direction of three of the Coeur d'Alene district's expert millwrights, R. S. Handy and Cy Garber, of the Bunker Hill staff, and W. L. Zeigler, general superintendent of the Hecla Mining Company's milling plants. The work will be extensive, stated Mr. Haffner, but will be installed gradually by units so as not to disturb the normal output of the plants. The idea is to bring the Bunker Hill milling plants up to a standard of excellence second to none and which will embody every recognized improvement in milling practice adapted to Coeur d'Alene ores.

▶ The Glacier Silver-Lead Mining Co., which formerly operated a mining property and a 150-ton flotation mill at Libby, Mont., is moving its milling equipment to Owyhee County, Idaho, where it has acquired an antimony-silver property. The company recently sold a 300-ton ball mill to the Tamarack & Custer Co. This mill will be installed at the Dorn mill of the Tamarack in the Burke Canyon and will be part of new mill equipment designed to increase the present 325-ton capacity of that plant.

▶ The U. S. Bureau of Mines has been authorized to investigate possible aluminum clay deposits in northern Idaho and eastern Washington, according to advices from Washington. The Bureau is said to have provided a special appropriation for the work and has appointed James Semple engineer of the project, with headquarters at Moscow. Questionnaires are soon to be distributed to all owners of clay land. Bonner County claims to have large deposits of what is reported to be aluminum clay.

▶ The Highland-Surprise Mining Co., near Kellogg, has shipped its first car of zinc concentrates to the Sullivan zinc plant since resuming operations, and is now loading the second car for shipment. It is estimated that the mill feed will produce about eight cars of zinc to one of lead. The mill is operating at its rated capacity of 150 tons a day.

▶ Sunshine Consolidated, Kellogg, is considering the development of the Rockford group of 12 claims, located on the western end of its Big Creek holdings. The Rockford is said to have a promising showing of zinc-lead ore. The company reports that the development of its Big Creek group from the 3,100 level of the Sunshine mine is progressing as rapidly as short labor conditions will allow.

TAM RUTILE

An effective flux and arc stabilizer for heavy coated welding rod

With the development of the heavy coated welding rod, TAM Rutile has risen to an important place among the fluxes for use in coating welding rods.

TAM Rutile is an effective arc stabilizer and tends to eliminate oxides and nitrate needles in the deposited metal. TAM Rutile, closely controlled in analysis and particle size, insures strong homogeneous welds providing consistently dependable results.

A TAM Field Engineer will gladly help you to adapt TAM Rutile in your own welding rods. Write:

TAM ZIRCONIUM AND TITANIUM PRODUCTS
Registered U. S. Pat. Off.

THE TITANIUM ALLOY MANUFACTURING CO.

GENERAL OFFICES AND WORKS: NIAGARA FALLS, N. Y., U. S. A.
EXECUTIVE OFFICES: 111 BROADWAY, NEW YORK CITY

$100,000,000
worth of **SCHEELITE**
has been located by
MINERALIGHT

find hidden values

NEW MODELS
Featuring:
GREATER EFFICIENCY
HIGHER INTENSITY
LIGHTER WEIGHT
Built-in Flashlight and Selector Switch

FREE 4-Color Catalog

Miners and Prospectors—***Attention!***

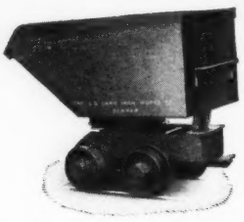
Are you overlooking hidden Tungsten values in gold, silver, lead and copper properties? Mineralight can help you find them as it has hundreds of others. This magic light also checks presence of Mercury accurately and reliably.

Many models—from large installations for grading to portables of all sizes. New catalog shows ore samples in actual color. Money-back guarantee and 20 free ore specimens with each lamp. For complete information—

WRITE DEPT. S. TODAY

ULTRA-VIOLET PRODUCTS, Inc. 5205 Santa Monica Blvd. Los Angeles, California

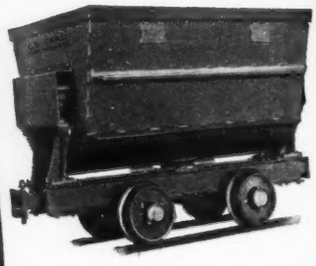
CARD CARS



Can you use Important increase in car capacity without increase in over-all dimensions of car?

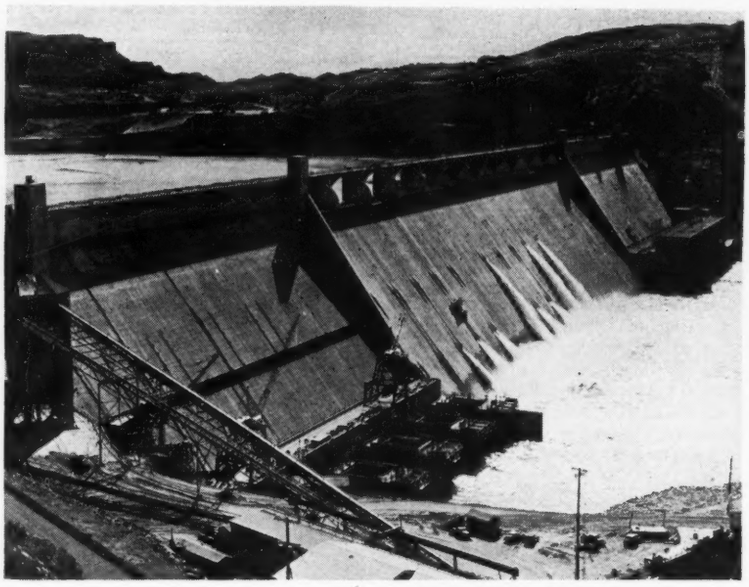
By improved design, Card Engineers often have added 5%, 10%, even 20% to capacity without increase in size. Perhaps we can show equal results for you.

Every Card Car is an Ace in the hole



Have you our Catalog 40?

C.S. Card Iron Works Co.
Denver, Colorado



Grand Coulee dam, now completed, will bring metallurgical plants and mine development to the surrounding region

▸IDAHO

▶ About 200 Idaho mining property owners in Custer and Lemhi counties are being asked to list their mineral holdings in a wholesale move toward large development operations with the help of RFC funds, according to Allan C. Merritt, Idaho Commissioner of Public Works. If results of the proposed investigations are favorable, said Merritt, negotiations will be started to secure extensive road improvements, and if sufficient mineral can be developed to warrant it, a smelter may be constructed at Twin Buttes, east of Arco.

▶ Zinc concentrates of high quality are being produced for the first time at the Clayton Silver Mines property at Clayton, Idaho, in the Bay Horse mining district. A zinc unit has recently been added to the company's concentrating mill and started turning out concentrates in June. Manager C. A. Fay reports concentrate assays of 58.6 percent zinc, 1.5 percent lead, 3.8 oz. silver, 0.006 oz. gold and 3.4 percent iron. The company is producing lead, zinc, silver, copper, and gold, with importance of those metals indicated in the order named, said Manager Fay.

▶ The Victory Metals Corp., at Murray, has started its new concentrating mill and commenced the shipment of lead and zinc concentrates to the Bunker Hill smelter and Sullivan zinc plant. Trial shipments to the zinc plant averaged 54.4 percent zinc and shipments to the lead smelter averaged 55.6 percent lead, according to reported returns received by the company. The ore is from the old Monarch mine, at Murray, and the milling plant is the rebuilt gold mill of the Mother Lode Gold Mines at Murray, which embraced the Daddy and Mother Lodes mines, famous gold producers of pioneer days.

WASHINGTON

Metaline to Seven-Day Work Week

Grandview mill handling good tonnage—Butte-Highlands drilling Metaline property—Morning Star to develop Comstock claims

▶ Construction work on war production plants in or adjacent to Spokane will cost more than $200,000,000. These plants include aluminum reduction works and an aluminum rolling mill and a magnesium plant.

▶ Grandview Mines Co., of Metaline Falls, is treating 500 tons of ore daily. Of this amount, the larger part is from the mine of the Metaline Mining & Leasing Co. and the remainder, almost as much, from the Grandview mine. Grandview Mines Co. will pay its fourth dividend, amounting to 1c. a share, on Aug. 1, bringing the company's total payments to $105,000.

▶ W. H. Gaines, of Spokane, has been shipping zinc and lead concentrates from the Cleveland mine, west of Springdale, to the Bunker Hill smelter at Kellogg. The ore is first concentrated at the mill of the Deertrail Monitor Mines Co., in the same county. The property belongs to Carr brothers, of Valley, Wash., and J. H. Forney, of Springdale. It is an old mine formerly worked for its silver-lead ore.

▶ The Electric Point mine, at Leadpoint, now owned by Arthur Simonton, postmaster, is being worked by Ralph Davis, of Montana. It is already in production. The ore carries lead with some silver.

▶ A 100-ft. winze has been sunk in the Red Top mine, in northern Stevens County. This is in an orebody into which a 100-ft. raise also has been made. The ore carries 20 percent zinc, 40 percent

lead, and a substantial quantity of silver, according to J. Richard Brown, of Spokane, president and managing engineer. This property is opened by a 2,400-ft. tunnel.

▶ Howe Sound Co., at its Holden mine, in the Cascades, is employing 450 men. John J. Curzon is general manager. Because of war restrictions the company is not making any report on the volume of ore handled, but it continues to pay its regular quarterly dividend of 75c. a share. Its production is chiefly copper with an important gold content. It is the largest producing mine in the State.

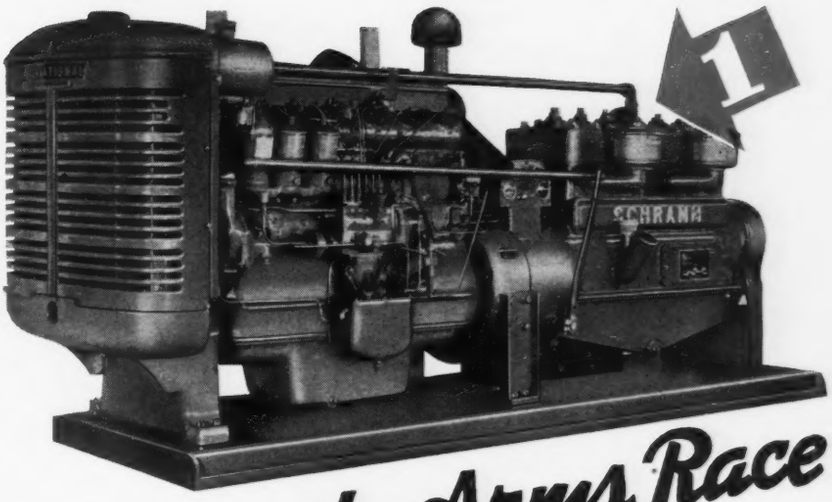
▶ Pacific Mutual Silver Lead Co., C. A. Gray, Spokane, manager, has let a contract for an additional 300 ft. of development at its property near Keller. Part of this work is the extension of the company's Mammoth tunnel to the bottom of the No. 2 B. H. shaft. Mr. Gray estimates this will make available an additional 10,000 tons of high-grade milling ore, containing lead, zinc, copper, and silver. This tunnel is expected to tap three veins and open enough ore to justify the installation of a mill.

▶ Butte-Highlands Mining Co., of Spokane, which has closed its operations for the time being near Butte, Mont., has taken, on a bond and lease, the property of Leadhill Mines Co., in the Metaline district. The company has given a drilling contract to McClintock Diamond Drill Co., of Spokane, which is employing two crews. L. K. Armstrong, of Spokane, former secretary of Columbia Section of the American Institute of Mining & Metallurgical Engineers, is chief owner in the Leadhill.

▶ Industrial Tungsten Corp., of Spokane, Ray B. Greene, of Spokane, manager, has had a thorough examination made of the company's property in the Germania district by Henry Mears, who has made a report recommending future operations, which Mr. Greene says will be followed. Last year this company shipped $15,000 worth of tungsten concentrates.

▶ Morning Star Mining Co., Roger O. Oscarson, Spokane, president, has acquired the Comstock group of claims in Ferry County and while developing them will continue to operate the Morning Star group, which has been a steady gold producer for several years. Both properties are near Danville and near the Canadian line but on opposite sides of the Sanpoil River. Copper predominates in the Comstock ore. Mr. Oscarson says a new tunnel will be run in the Comstock to develop it at 100 ft. additional depth. The Morning Star company is controlled by the Oscarson brothers, Roger, P. E., and W. L., mining engineers.

▶ Metaline Mining & Leasing Co., operating its own property and the mine and mill of Grandview Mines Co. at Metaline Falls, announced at its annual meeting of stockholders in Spokane on June 16 that it will step up operations from six to seven days a week. Howard I. Young, of St. Louis, president, announced that this is being done to meet a shortage of zinc. American Zinc, Lead & Smelting Co., of St. Louis, owns a controlling interest in Metaline Mining & Leasing. The retiring board was reelected. D. I. Hayes, of Spokane, is vice president and general manager.



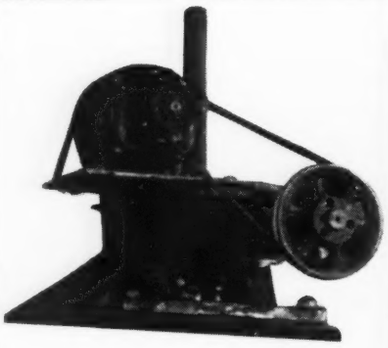
No. 1 in the Arms Race

First comes the compressor (1) that drives the drills (2) that start the ore to the smelters (3) that supply the mills (4) that produce the metal by the millions of tons for our weapons of war (5) What a responsibility for that "lead-off" equipment! They've got to go "all out" all the time to keep up with the demand for more and *more ore* . . . For stamina that can cope with around-the-clock operation look to

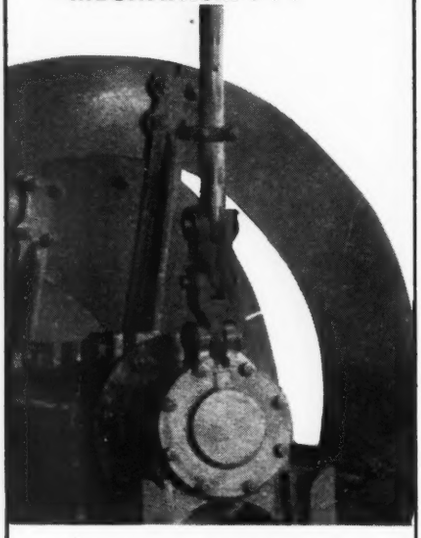
SCHRAMM
COMPRESSORS

They've earned their chevrons on hundreds of jobs where the going is tough and mechanical help far away . . . From the versatile little Fordair compressor to the big Diesel driven models you can depend on Schramm to give you more air per horsepower, per dollar. *Write today for Catalog 42-S.*

SCHRAMM INC.
WEST CHESTER, PENNA.



THE SCREW-LIFTING MECHANISM . . .



. . . AND THE SUBMERGED BEARING

Make The

WEMCO

SCREW CLASSIFIER

An efficient, time-saving machine. It is not necessary to "dig out" the tank either before or after a shut down.

The Bousman Submerged Bearing insures constant operation. It is a double packed anti-friction type ball bearing with renewable sleeves and automatic packing take-up, grit and moisture proof.

Let us send you our new Bulletin SC 941

WESTERN MACHINERY COMPANY
FOR OVER 28 YEARS A SYMBOL OF SERVICE AND SAVINGS TO INDUSTRY

WESTERN MACHINERY COMPANY

LOS ANGELES · SACRAMENTO · SPOKANE · SALT LAKE CITY · PHOENIX · DENVER

760 FOLSOM ST., SAN FRANCISCO, CALIFORNIA

The Vindicator mine, in the Cripple Creek district, Colorado, the shaft of which is 2,179 ft. deep, will be dewatered when a 5,500-ft. lateral is driven from the Carlton tunnel by the United Gold Mines Co.

COLORADO

Vanadium Output on Upgrade

Ajax cuts Bob Tail vein—Aspen, Greenville, and Empire reviving—Widespread developments involve various metals

▶ In the opinion of mining engineers, the original Newhouse tunnel, now known as the Argo tunnel, driven to demonstrate the continuity of veins in Clear Creek and Gilpin counties, has done more to prove the value of veins at depth than any other single development. It has also demonstrated the necessity for tunnel owners to acquire title to the properties through which their tunnel is to be driven before undertaking the work. A property that may display little value as the result of superficial workings may produce rich ore when opened at depth; then an arrangement fair to the tunnel owners may be difficult to make.

▶ At Durango, the U. S. Vanadium Corp. has Everett Hess and his gang engaged in repairing three buildings recently purchased from the old smelter. It will require some 75 days to complete construction of the new vanadium mill, which will have a capacity of 150 tons per day. At present practically the entire domestic supply of vanadium is coming from eastern Utah and western Colorado. Blair Burwell, general superintendent, stated that the new vanadium mill to be built at Grand Junction will work on ores from districts not now producing, and that it will have the same capacity as the one being built at Durango. There are hundreds of small vanadium mines and properties over the San Juan Basin that will supply ample ores to the new mills. The tonnage will be trucked in, and an ore-purchasing agency will be established at Dove Creek to acquire production from mines in this region. Probably another agency will also be set up to gather miscellaneous vanadium ores from various portions of the San Juan region. The output of all of the U. S. Vanadium is shipped direct to plants engaged in war work production, the vanadium being used in highly stressed steel.

▶ The Pride of the West mine, near Silverton, has launched its increased production program. The mill has been enlarged to 120 tons' daily capacity; a new forge and drill sharpener, and a new compressor are added facilities. Pride of the West was one of San Juan's continuous producers last year, and the production for 1942 bids to be even greater. Ralph Shimmin, mill superintendent, has had a busy winter in putting this property in condition, following a fire last fall.

▶ The famous ore-bearing Bob Tail vein was recently cut on the 28th level of the Ajax mine, on Battle Mountain, Cripple Creek. Superintendent Charles Carlton stated that the strike was especially encouraging, as the find is in a territory where good ore has never been cut before, and samples returned as high as $160 per ton. The rich 200-ft. oreshoot on the Bob Tail vein on the 26th level of the Ajax is about 900 ft. south of where the newly cut ore occurs on the 28th level. Carlton further states that the operators were driving back on 2,800 to hit the Bob Tail vein and locate a place to cut a sump, and had no expectation of finding ore in that territory. This new strike is one of a series which have been made on this property during the past twelve months, and that have brought the mine production up to a startling figure, most of which can be credited to the new Carlton tunnel.

▶ The Herron Bros., who have a small mill at Aspen, have asked the RFC for funds with which to enlarge same to a capacity of 150 tons daily, in order to treat the custom ores of the vicinity. E. P. Chapman, Jr., RFC engineer, has completed his examination and made a report. There are many valuable dumps of ore near Aspen that could be handled commercially in a good mill.

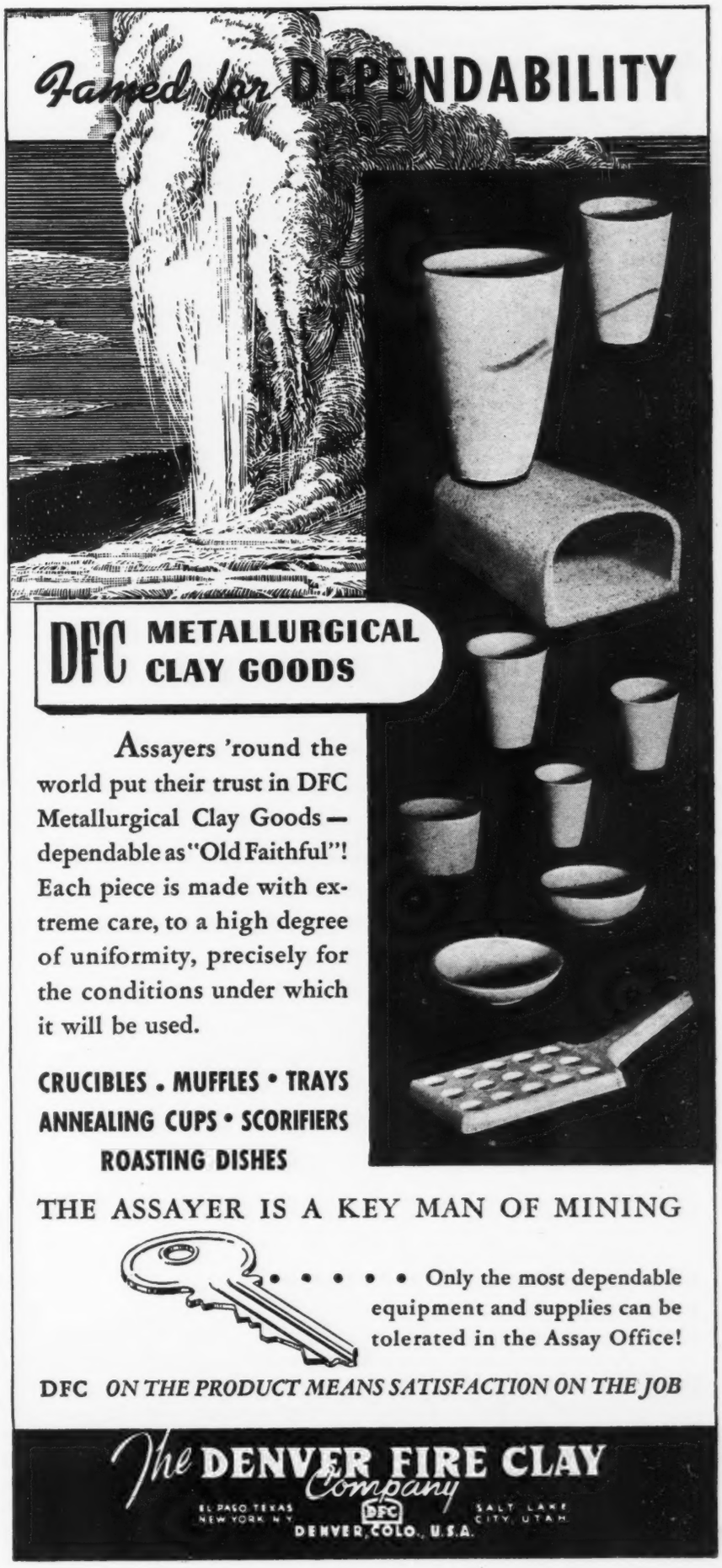
▶ The topographical and geological map of the Kokomo-Robinson area, in Summit County, has been completed by the U. S. Geological Survey in cooperation with the Colorado Metal Mining Fund. This area comprises an elongate tract of about 12 square miles, within which are located most of the productive mines of the old Ten Mile district. Hand-colored copies have been prepared and are available for public inspection.

▶ Smelter returns on ores from the Franz claims at Greenville, near Clark, north of Steamboat Springs, were so favorable that a Salt Lake City engineer is examining the property. Test shipments totaled over a ton, worth $18, on which there was a bonus of nearly $11. Mr. Franz is working a small force of men, cleaning out the old tunnel and doing other incidental work. The zinc vein is 4 ft. wide and is exposed by tunnels at three different places. The Greenville deposits are among the oldest in the country.

▶ The Mint and Cashier properties that lie on the southern slope of Covode Mountain within the boundaries of Empire, contain veins that apex closely. A large amount of virgin ground is available for operation in the Cashier, although large tonnages have been removed from time to time. The vein is large and quantities of smelting ore, assaying 3 oz. of gold, have been shipped from this property. The work accomplished on Covode Mountain has brought the locality to the front. The veins of Silver Mountain appear to reach their greatest value when they trend into Covode Mountain. The Empire City mine had its origin in the 70's, and its first contribution was from a surface pocket of free-gold-bearing quartz that ran as high as $5 in gold to the pan. Following the mining of this pocket, an adit was started down the hill. After some developments an ore-shoot 150 ft. long was encountered. The Empire City vein is large and strong, and is easily traced over the surface.

▶ The Bluebird mine, 4 miles northwest of Nederland, has encountered a good strike of silver ore in driving the upper tunnel. Heretofore, the vein has been flat, but started to dip sharply, and is now going straight downward as a vertical fissure. The ore is said to be 3 ft. wide, with assays up to 160 oz. of silver per ton. Bromides and ruby silver are scattered throughout the entire width. The new caterpillar diesel-driven mill is in full operation and the first concentrates contained over 400 oz. of silver per ton. Mill heads assay 15 to 20 oz. silver and are obtained from the dumps and stope fills.

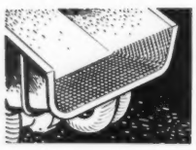
▶ President Merrill Shoup, of the Golden Cycle Corp., states that the Portland mine will be hooked up with the Carlton tunnel within another month. The raise which is being made from the Carlton tunnel level to connect with the Portland shaft has reached the winze level, 118 ft. from the floor of the tunnel, and a crosscut to connect with the winze has been started by tunnel crews. Superintendent Bob Welch reports this crosscut will be 60 ft., long, and that following this connection a station will be cut on this level—the 3,100. Following this work an 85-ft. raise will make the Portland shaft 3,250 ft. deep from the top of Battle Mountain to the Carlton tunnel level. On completion of this work, waste from the laterals to the Cresson and the Vindicator mines will be either hauled through the tunnel or raised through the Portland shaft. Beyond the station the line of the tunnel extends to the contact—that important junction of granite and breccia which marks the margin of the ore-bearing crater. This is the goal set when the tunnel was started. The flow from the tunnel is approximately 5,000 g.p.m.


Famed for DEPENDABILITY
DFC METALLURGICAL CLAY GOODS
Assayers 'round the world put their trust in DFC Metallurgical Clay Goods — dependable as "Old Faithful"! Each piece is made with extreme care, to a high degree of uniformity, precisely for the conditions under which it will be used.
CRUCIBLES . MUFFLES • TRAYS
ANNEALING CUPS • SCORIFIERS
ROASTING DISHES
THE ASSAYER IS A KEY MAN OF MINING
• • • • • Only the most dependable equipment and supplies can be tolerated in the Assay Office!
DFC ON THE PRODUCT MEANS SATISFACTION ON THE JOB
The DENVER FIRE CLAY Company
EL PASO, TEXAS
NEW YORK, N.Y.
DFC
SALT LAKE CITY, UTAH
DENVER, COLO., U.S.A.

Stringer Beads*

SOLVE MINE HARD-FACING PROBLEMS

In cases where it is impractical to protect mining equipment against abrasive wear by the application of a solid deposit of hard-facing material, stringer beads may be substituted with excellent results.



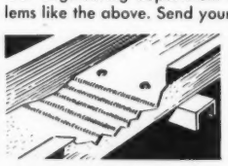
Here's a typical example. An Arizona mining company found it necessary to replace or repair dump truck bodies at frequent intervals because of the severe wearing action of the rock loads against the steel bottoms and sides.

Stringer beads of coated Stoody Self-Hardening (see sketch) solved the problem. These beads were approximately 3/16" high, 3/8" wide and spaced about 4" apart to absorb the major part of the wear and keep the rock from coming in contact with the truck body. The beads are easily replaced when they finally do wear away and maintenance costs are greatly reduced.

Shaker pan conveyors present a similar problem. The ends of the pans, bolt heads, and areas depressed by the weight of the ore wear rapidly. The life of shaker pans can be greatly increased by hard-facing the bolt heads with coated Stoodite and protecting the ends and other areas with stringer beads of Stoody Self-Hardening. (See sketch below)

One and a half pounds of coated Stoody Self-Hardening and two or three ounces of Stoodite usually provide ample wear resistance for a shaker pan eight to ten feet in length.

Our engineering department specializes in problems like the above. Send your problems involving equipment wear to the Stoody Company. This service is free to you.

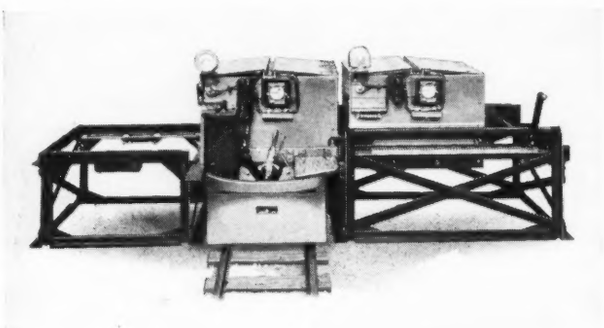


*A Series of Hard-Metal Beads Properly Spaced to Prevent Wear on Parent Metal.

STOODY COMPANY • 1134 W. SLAUSON AVE.
WHITTIER, CALIFORNIA

STOODY COMPANY Hard Facing Alloys

ATLAS BATTERY CHANGING STATION



A simple, compact and efficient method for changing batteries. Complete change of batteries in three to five minutes. Used battery is rolled off of locomotive and fresh battery installed at the same time.

Complete details in our Bulletin No. 1226.

THE ATLAS CAR & MFG. CO.
★ **CLEVELAND, OHIO, U. S. A.** ★

ALASKA

Iron Prospects Encouraging on Kasaan Peninsula

Considerable antimony accumulating at gold mines—Good water supply for placer operations — Alaska-Juneau raises wage scale

▶ Active building operations are everywhere in progress in the town of Seward, which was destroyed by fire. Among the structures being rebuilt are the Seward Hotel, the Seward drug store, and other business houses. Leases are being given for sites for new building, and residences are being put up.

▶ Owners of antimony prospects are filling out blanks to be forwarded to Washington and deposits are being reported from many districts. From 1 to 20 tons of stibnite is said to be piled about the portal of almost every lode gold mine in the Fairbanks district. Sam Gamblin's mine on Tok River has ore containing 20 to 30 percent antimony. There is said to be antimony near Holy Cross, on the Yukon, and at the property of Howard Sparks in the Broad Pass country.

▶ Men from the U. S. Geological Survey are starting a search for strategic minerals. John C. Reed, E. N. Goddard, L. A. Warner, and Matt Waltom, geologists, compose a party which will survey the Kasaan Peninsula for iron ore deposits. Later surveys will be made in the Juneau district, and Frank Beyers and Richard Gault will seek tungsten deposits in the Portland Canal district.

▶ Mining operations are active this year in the gold fields and platinum areas in the Goodnews Bay district. Placer operations are being carried on in several districts of the Territory, including the Fairbanks, Nome, Flat, and other camps and in localities on the upper Kuskokwim and Iditarod streams and along the Yukon from Dawson to Ruby and Marshall. Goodnews Bay Mining Co., Charles J. Johnston, manager, of Platinum, is reopening the company's holdings near Platinum. The enterprise includes an 8-ft. Yuba dredge, capable of operating 50 ft. below water level. This company also has two dragline outfits in the vicinity of Goodnews Bay.

▶ L. E. Tuthill, superintendent of Cliff Goldmines, reports the installation of an electric hoist, a ventilating fan on the 500-ft. level, and underground telephones connecting all sections of the mine, near Valdez. Development is progressing south on the 550-level.

▶ Examinations of a dozen magnetite orebodies on the Kasaan Peninsula indicate that the iron content may be as high as 60 percent. Copper content is estimated at about 0.5 percent and the sulphur content about 1.5 percent. High grade magnetite bodies are estimated to contain 25,000 to 2,000,000 tons each.

▶ United States Smelting, Refining & Mining Co. had six dredges operating in the Fairbanks district before the first

of June. These are Dredges No. 2, on Goldstream; No. 3 at Chatanika; No. 5 at Cleary; No. 6 at Ester; No. 8 at Fox, and No. 10 on Cripple Creek.

▶ Plenty of water in the Nome district is promised by snow, which is heavier than for eight to ten years. This is important, as water in quantity in the ditches will enable the miners to meet a possible shortage of oil. Oil conserved will help Nome go through a second winter and carry operations into 1943.

▶ C. S. Coleman, consulting engineer of the Willow Creek Mines Co., reports that the Lucky Shot mill last season treated 15,395 tons of ore and recovered 7,006.78 oz. of gold, valued at $245,237.27, an average of 0.46 oz. per ton. The mill operated at capacity only for the first few months last year, when labor shortage forced it down to 40 tons a day, and then to 25 tons. Labor and supply conditions make future operations uncertain.

▶ Louis Nadeau, of Chief Gulch, brought into Dawson last month a 7-lb. nugget estimated to be worth $1,200 and said to be one of the largest ever found in the Klondike.

▶ G. Goldthrop Hay, president of Yukon Consolidated Gold Corp., of Fairbanks, reports that following ample snowfall last winter working conditions are substantially better this spring than a year ago. Dredges are well supplied with water, enabling all but one to start before May 1. Last year this company showed a net profit before write-off of $1,005,753, against $1,171,801 in 1940. Supplies and repair parts were increased last year by $156,000 and there was a further increase of $258,000 in stripped, thawed, and prospected ground. Cost of this work was met in part by new money raised by debentures and by exercising options. Cash Dec. 31, 1941, was $133,792 and inventories were $679,824.

▶ W. J. McDonald, of Anchorage, director of Alaska fire control, reports many early season fires in different districts of Alaska. Soldiers, miners, forest service men, and Civil Aeronautical Administration men joined in extinguishing a bad fire in the vicinity of Nugget Creek, said to have started from a lighted cigarette carelessly thrown. He reports other fires at Mile 8, on the Clear Creek buttes, on Steel Creek, on 10,000 acres close to Chickaloon, and on 500 acres near Ester, 8 miles west of Fairbanks. There was some threat to mine operations.

▶ Cleary Hill Mines Co. paid a 5c. quarterly dividend June 1. The disbursement was $15,000. The company operates two properties, one of which comprises 20 quartz claims with a 20-stamp mill, 25 miles from Fairbanks. The other property is placer ground of 1,700 acres near Tofty, 125 miles northwest of Fairbanks.

▶ J. A. Williams, superintendent of Alaska Juneau Gold Mining Co., at Juneau, reports that a new agreement between the company and the CIO union has been made, giving a general increase in the wage scale of 8c. an hour on the base rate. This amounts to about 70c. a day per man.

MICHIGAN

C & H Purchases Detroit Fabricating Plant

Copper mine valuations increased—C & H raises wages again—Quincy, developments encouraging

▶ Tentative valuations of copper mines in Houghton and Keweenaw counties have been increased approximately $315,000 over the final valuations for last year by the State Tax Commission. The recommended valuations for 1942, as given by Franklin G. Pardee, appraiser of mines, are $6,685,650, compared with $6,370,862, the final valuations last year. The brunt of the increase is borne by the Champion and Globe mines of the Copper Range Co., which have been increased from $700,000 to $900,000; the Douglass property of the Calumet & Hecla Consolidated Copper Co., from $50,000 to $100,000, and the Seneca tract of the Peninsula Copper Co. (under option to C. & H.) from $200,000 to $250,000. There are several decreases in the recommended valuations, including the reclamation project of Calumet & Hecla, from $2,395,000 to $2,290,000, and the Conglomerate and Osceola mines and shops of Calumet & Hecla, from $520,000 to $510,000.

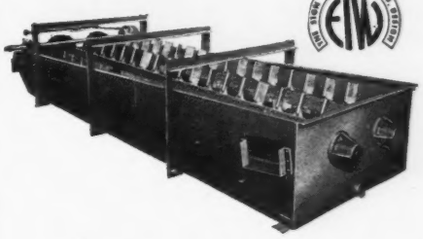
▶ Purchase by the Calumet & Hecla Consolidated Copper Co. of the Wolverine Tube Co., Detroit copper and brass fabricators, has been consummated, following approval by stockholders of the Wolverine company of an offer for the outright cash purchase of the company's assets. The price paid is $2,690,361. The plant employs about 900 men. At present it is engaged in war production. Acquisition by Calumet & Hecla will provide an outlet for the mine product during the post-war reconstruction period.

▶ A wage increase of 25c. per shift and a work-week vacation of five days with pay have been announced by Calumet & Hecla, effective as of June 1. The increase is the second made by Calumet & Hecla in recent months. The last was 60c. a day, effective Sept. 1, 1941. The scale now is substantially higher than that of any other Michigan copper company. In view of the urgent demand for copper for the country's war needs, the company has advised that every eligible employee continue working and receive vacation pay instead of taking a vacation with pay.

▶ Quincy Mining Co., since April 16, 1942, has been receiving 17c. per pound for all copper produced, per agreement with the War Production Board. All copper openings in Quincy continue in rock of fair grade. A recent development is the opening of the Old Pewabic lode, known as the footwall lode. Considerable stoping has been done, with encouraging results. A long crosscut also has been driven to the "far west" lode that showed good copper values in a drill hole put down in 1940. All the drifts going north continue in good lode rock. Loss of copper in the tailings has been considerably reduced by the remodeling of a stamp head unit in the Quincy mill.

Eagle Log Washer

FOR WASHING MINERAL ORES



Find out how VALUABLE this Paddle Type Unit can be to you

The greater cutting or abrading action of the Eagle Paddle Log Washer may be exactly what you require. This unit is demonstrating its ability in services where tough clay or conglomerate impurities appear in the gravel and is proving a "natural" for manganese ore washing.

WHY YOU GET DEPENDABLE LOW COST RESULTS

BOTTOM WATER INLETS furnish an upward current of water the full washing length of the tub to raise and float out the foreign material of specific gravity lighter than the aggregate.

PADDLES 36" DIAMETER of our special semi-steel mixture deeply chilled on the wearing surfaces insure the greatest amount of service.

TIMKEN ROLLER BEARINGS operate in housing above the water line where they take all the end thrust of the log shafts. No chance for grit to wash into the bearing and cut it out.

SEND MATERIAL SAMPLES

If you will send us material samples for inspection and laboratory test and tell us of your present setup, we will be glad to tell you how our washers fit into your operations. NOTE: WE CAN MAKE IMMEDIATE DELIVERY ON ALL REPAIRS FOR WASHING UNITS.

Eagle Iron Works pioneered the use of spiral screw washers in the washing of aggregate in the sand and gravel industry—these units were given immediate acceptance upon introduction. From this pioneering and our succeeding experience for many years has come many specialized jobs of building and supplying MINING companies (handling iron ore and gold) with standard or special equipment.

•

THE EAGLE IRON WORKS

DES MOINES, IA.

PAN-AMERICAN SERVICE AND EQUIPMENT for Mill and Placer Operations

ENGINEERING:

Metallurgical Testing and Field Consulting Service on Jigging, Flotation, Cyanidation and Placer Recovery Methods for Dredges and Doodlebugs.

Design of Recovery Plants in Mills and on Dredges; Complete Mill Design.

EQUIPMENT:

Placer and Pulsator Jigs... Flotation Machines... Reagent Feeders... Dewatering Cones and Drags... Oil Burners for Industrial Uses and Heating.

Information on the above services and equipment will be gladly sent on request.

PAN-AMERICAN ENGINEERING CO.

820 Parker St., Berkeley, Calif., U. S. A.

Cables: "Panco"

Design, Metallurgical Testing and Field Consulting Service; Manufacturers of Mill and Placer Recovery Equipment.

TRI-STATE

Many New Operations

Mechanical loading on increase—Several additions to tailings re-treatment capacity —Eagle-Picher active

▶ A definite trend toward the use of mine-car loaders in the Tri-State zinc- and lead-mining field, to offset a tightening labor supply, particularly shovelers, who have been attracted to other defense industries, has been noteworthy during the last few months. By the first of June, sales representatives of three companies—Gardner-Denver, Sullivan, and Eimco—had placed 28 of the air-operated mechanical muckers in mines of the district and had a total of 42 additional machines on order. Among the mining companies that have introduced, or plan to introduce, the loaders in their mine workings are the Galena Mining Co., Madison Mining Co., Skelton Lead & Zinc Co., Eagle-Picher Mining & Smelting Co., Stotts City Mining Co., Mutual Mining & Development Co., Mahutska Mining Co., Cameron & Henderson, Inc., Federal Mining & Smelting Co., Kansas Explorations, Inc., Lula Bell Mining Co., and Rialto Mining Corp. The loaders not only reduce the manual labor of underground ore loading, but have made it possible for many companies to maintain, or increase, their production in the face of lower grades of ore, and increasing labor shortages and costs due to the war effort.

▶ New mining activities—and developments in the making—indicate that weekly output of zinc concentrates in the district may hit around 10,000 tons during the latter part of the year, but how long such a rate can be maintained under the present quota system remains to be seen. With the recent expansion in tailing mill re-treatment capacity, an increase in this type of production should result. Although the tailing mill output during the summer months is expected to climb to a 1,500-ton weekly level, it is uncertain at this time how long such a level will be maintained, as this portion of the local mining and milling industry is passing through a definite transition stage—from the re-treating of first to second- or third-run tailings. Plans for increasing tailing output, or even maintenance of the present rate of from 1,200 to 1,300 tons weekly, were based on the granting of a zero quota to this branch of the local zinc industry. It is hoped that the federal premium will offset the increased costs of handling larger tonnages of thinner tailings. The expansion in tailing mill capacity was due to the reconditioning and enlargement of the Ottawa and Sooner plants of Tri-State Zinc, Inc. (with installation of a new H.-H. sink-and-float unit at the latter), both of which resumed operations during the later part of May; the starting of the large, up-to-date No. 4 plant of Evans-Wallower Zinc, Inc.; the resumption of full-scale operations by Cardin Mining & Milling Co.; and the subsequent revamping of the old Skelton mine mill into a 65-ton-per-hour plant for the re-treatment of the Skelton tailings by the C., G. & C. Co. The last-named organization began operations during the second week of the month with A. W. White, of Miami, in charge.

▶ Progress is being shown in the construction of two concentration plants, west and northwest of Joplin. They are the new Jasper mill of the Kansas Explorations, Inc., on the old A. W. C. mining tract, a mile and a quarter west of Schifferdecker Ave. and a quarter-mile north of U. S. Highway 66. The Jasper mill is being designed to handle in excess of 1,000 tons of ore rock daily from the old sheet-ground area around the 200-ft. level, according to Ross Blake of Joplin, district manager for the company. The other new mill being erected is that of the High Grade Mining Co. on the old Joplin-St. Louis tract, a mile northwest of Chitwood. This plant, which will have a capacity of 25 tons of ore per hour, is being built in conjunction with a derrick and hopper over the old Ethel Gray shaft, which is situated at about the center of the 160-acre tract.

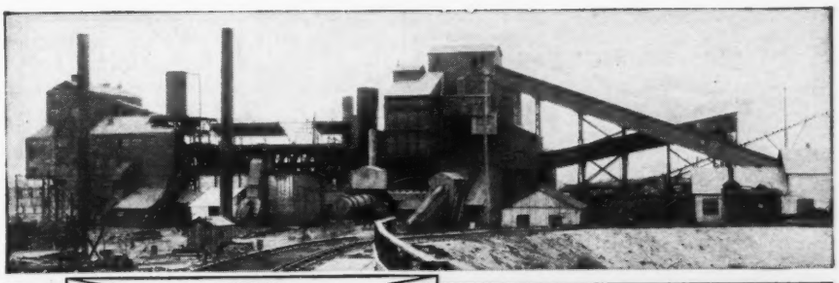
▶ After completion of a new shaft on the Hartley land—a 120-acre lease situated about three-quarters of a mile west of Baxter Springs—the Dines Mining Co. is starting another shaft on the Minnie Douthat DeVillers land, a half-mile northeast of the Eagle-Picher Central mill. Early this year the company drilled several holes in the immediate vicinity of the shaft site. The new shaft will be sunk to a depth of 310 ft., where the drilling disclosed a sheet-ground orebody. When the development work is completed and the orebody is opened up, ore will be trucked to the company's Blue Mound mill, north of Picher, in Kansas, for treatment, according to H. G. Weidman, of Baxter Springs, manager.

▶ Preparations are being made by the Eagle-Picher Mining & Smelting Co. to divert most of the ore being mined by the Oronogo Mutual Mining Co. at its open-pit mine at Oronogo to the Central mill, in Oklahoma. Plans have been completed for the laying of a 2,300-ft. spur from the main line of the Frisco from Carthage to Columbus, north of Oronogo, to the north waste dump, where a loading hopper will be constructed. Carbonate and silicate ores from above the 90-ft. level, including that already stockpiled, will continue to be treated over the Eagle-Picher American mill at Oronogo, according to Guy H. Waring, Oronogo Mutual manager. The Eagle-Picher company also is reopening the east shaft on the Merton Goodeagle lease, just south of the company's power plant a mile southwest of Cardin. A large steel derrick and 400-ton hopper have been moved from the Bird Dog No. 23 mine and placed over the east, or No. 1, shaft on the lease, which has been cleaned out and recribbed. The No. 2 shaft, a short distance to the west, is also being repaired and will be used as a man-and-supply shaft. Farther to the west, the company is completing a new shaft, over which a steel derrick and hopper from the John Beaver lease, northwest of Cardin, will be moved. Mine operations from the two ore-pulling shafts will be carried on around the 270-ft. levels, according to S. S. Clarke,

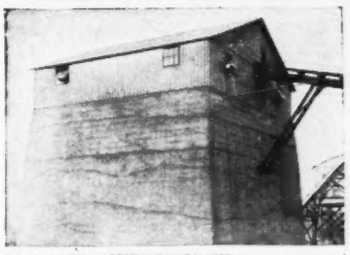
of Miami, general mine superintendent for the company. Ore from the mines will be hauled by rail to the company's Central mill. The company is also making preparations to reopen the old Crawford mine, a mile southeast of Quapaw, and has started hoisting ore at the old Netta mine, at Picher, where a wireline haulage system similar to that developed at the Blue Goose No. 2 mine is being used. The old Murphy shaft at Galena has been dewatered by Eagle-Picher, preparatory to the start of mining and the sending of ore from the old Short Creek flume area to the Central mill. Drilling is being continued by the company in the west Galena area, and some test holes are being put down south and southwest of the old Commerce Paxson mill, three miles west of Baxter Springs. The company has also been drilling on the Scott land, west of Duenweg, and quite extensively in the Quapaw area. In the Wentworth area, the company is mining on the Anna D lease, east of the company's Navy Bean mill. Operations are being conducted from the northeast field shaft on the Navy Bean lease, from which the Reynolds ground was worked formerly. Preparations also are being made by the company to dewater the old Velie-Leopard mines, a mile west of Baxter Springs. The company has recribbed the tops of two field shafts close to the old Velie-Leopard mill, preparatory to the installation of pumping equipment to be operated by an operating pool with operations or prospective operations in the west Baxter area. Three 10-in. Pomona pumps, powered by electric motors, will be installed in the two shafts, both of which are about 320 ft. in depth. Start of pumping operations is awaiting the arrival of equipment. With the dewatering of the old mines, Eagle-Picher will start underground operations and ship the ore by rail to the Central mill. A 1½-mile spur is being built to the two field shafts from a point on the Frisco system near the Ballard mill of the St. Louis S. & R. Co., southwest of Baxter Springs.

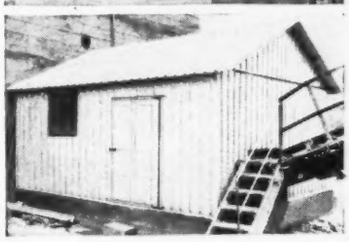
▶ Milling operations were resumed in late May at the 250-ton mill of the Romo Mining Co. on the Indian Catholic Mission lease, southeast of Lincolnville, according to Luther Owen, of Joplin, company superintendent. Ore from the Bingham Mining Co.'s mine, on the Bingham land, a mile south of Baxter Springs, is being trucked to the mill for treatment. The mill had been idle since last October, when heavy rains increased the inflow of underground water to such an extent that the Romo company's mines in the Lincolnville area were flooded and forced to shut down.

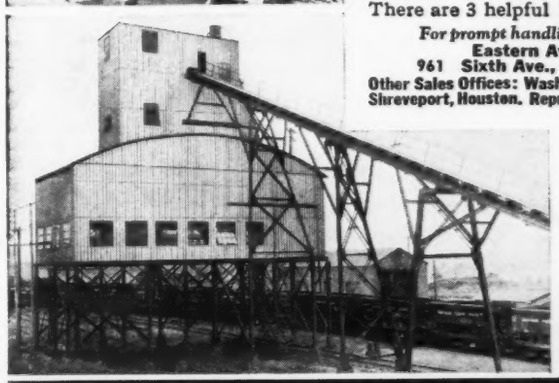
▶ F. & M. Mining Co., operating three shafts on the LaTosca lease at Oronogo, has completed a derrick and hopper over the old Bull Dog shaft, south of the Eagle-Picher American mill, from which the company will mine the old Morning Star ground. Although the shaft is about 200 ft. deep, mine operations will be carried on from the 130 to 150-ft. levels, and ore will be trucked to the company's Oronogo mill. Jesse Gilbert Fenix, of Joplin, has succeeded his father, Frank Fenix, former Missouri State Mine Inspector, as general mine superintendent in charge of operations for the company.



BUTLER READY-MADE STEEL BUILDINGS







AT THIS ONE MINE— THEY SERVE 11 PURPOSES!

Factory fabricated for speedy, bolt-together erection. This characteristic of Butler Steel Buildings is now of prime importance throughout industry. Particularly is this so in the No. 1 war industry—mining, where swift expansion of facilities is needed to produce the gigantic increased tonnages of raw materials vital for victory.

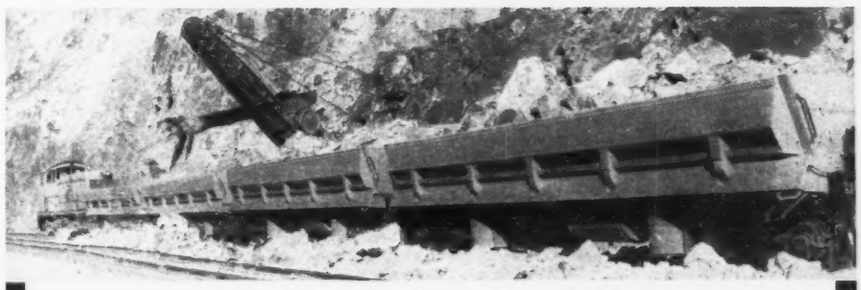
Next in importance is adaptability. At the Evergreen Mine pictured here 11 operations are housed in Butler Steel Buildings ranging from fan rooms to locomotive round house in the top picture—and from ore bin, conveyor boot to washing plant shown at left. Structurally strong, fire-safe Butler Steel Buildings serve permanently or they are quickly enlarged, taken down and re-erected with full salvage.

For over 30 years Butler Steel Buildings have served a score of industries. Before you build any structure, particularly any rated essential to prosecution of the war, figure with Butler engineers. There are 3 helpful Butler Steel Building books.

For prompt handling, address all inquiries to:
Eastern Ave., Kansas City, Mo., or
961 Sixth Ave., S. E., Minneapolis, Minn.
Other Sales Offices: Washington, New York, Chicago, Atlanta, Shreveport, Houston. Representatives in other principal cities.

OUT OF OUR WAR PRODUCTION WILL COME EVEN BETTER BUTLER PRODUCTS FOR PEACE

BUTLER MANUFACTURING COMPANY
FACTORIES
KANSAS CITY, MO.... GALESBURG, ILL..... MINNEAPOLIS, MINN.



DIFFERENTIAL AIR DUMP CARS • TWO WAY AUTOMATIC DUMPING
ECONOMICAL FOR ORE AND WASTE ROCK

DIFFERENTIAL STEEL CAR COMPANY
AIR DUMP CARS • MINE CARS • LOCOMOTIVES • ROCK LARRIES
BURDEN BEARING LOCOMOTIVES • COMPLETE HAULAGE SYSTEMS
FINDLAY, OHIO

3 reasons why you need

★ Smith ★

AIR COMPRESSORS

1

PORTABILITY

Think of the many advantages of such a lightweight, portable compressor! Move it easily from one job to another. Tow it at permissible truck speeds.

2

DEPENDABILITY

Made with FORD MOTORS and standard parts. Its ruggedness and efficiency are sources of constant satisfaction to users everywhere. Repairs and parts available at any Ford garage.

3

ECONOMY

Priced far below standard compressors of equal capacity. 60 cu. ft. size uses only 1 gal. of gasoline an hour!

Act Now!

The Smith has all the power you'll need for a majority of air-compressor work. Why let large cumbersome compressors produce a costly bottleneck for you?

With a Ford Motor and shop facilities you can assemble your own Smith Compressor. We will furnish a Smith Compressor Head and Accessories with complete instructions for mounting.

Write for free Booklet

GORDON SMITH & CO.

INCORPORATED

505 College St. Bowling Green, Ky.

IRON COUNTRY

Mahoning Mine Awarded Safety Trophy

First producer on Mesabi to be reopened —Missabe Mountain mine leased—Collar-to-collar issue on trial

▶ Iron-ore movement in May set an all-time record. Total shipments from U.S. ports amounted to 12,622,872 gross tons. The previous peak month was August, 1941, when 11,496,303 tons were shipped to Lower Lake ports. May was the first month in history to exceed 12,000,000 tons. The cumulative shipments for 1942 to June 1 are 21,204,656 tons, an increase of more than 3,500,000 tons over the corresponding period of last year.

▶ The 1941 National Safety Competition winners were announced recently by Dr. R. R. Sayers, Director of the U. S. Bureau of Mines. The trophy for the open-pit mines was awarded to the Mahoning mine at Hibbing, Minn. This mine is operated by the Pickands, Mather Co. W. G. Brown, of Hibbing, is superintendent. The mine worked 505,007 man-hours during the year without a lost-time accident. The following mines received honorable mention for their records of not having any lost-time accidents or whose accident-severity rates were very low: Armour No. 1 mine, at Ironton, Minn., operated by the Inland Steel Co., A. T. Anderson superintendent; Mahnomen mine, at Ironton, Minn., operated by Pickands, Mather & Co., F. A. Kelley general superintendent. These two mines are on the Cuyuna Range. The following mines on the Mesabi Range were awarded recognition for their safety record: Mesabi Chief mine, at Keewatin, operated by the Hanna Ore Mining Co.; S. A. Mahon, superintendent. The following mines operated by Pickands, Mather & Co., received honorable mention: Scranton mine, at Hibbing, E. J. Ferring, superintendent; Albany mine, at Hibbing, I. P. Schemmel, superintendent; Majorca mine at Calumet, W. D. Webb, superintendent; Corsica mine, at Elcor, Minn., Abe Matthews, superintendent. Also commended was Susquehanna mine at Hibbing, operated by the Republic Steel Corp., with John Hocking, superintendent.

▶ Two new producers on the Menominee Range, the Wauseca mine of the M. A. Hanna Co., and the Sherwood mine of the Inland Steel Co., hoisted their first ore in late May. The Wauseca is an old mine that has been shut down for ten years, having been formerly operated by the Mineral Mining Co. Full-scale production will be attained late this season. The Sherwood is a new mine, still in the early stages of development. The shaft is bottomed at 1,280 ft. for the time being, and will mine at four levels above this depth. Only partial production will be attained this season, as full output is not expected until 1943, when an annual capacity of 500,000 tons is anticipated. A dedication program was held on May 29, when the first skip of ore was hoisted. Ray D. Satterley, formerly of Ishpeming, is superintendent.

▶ Oliver Iron Mining Co. recently announced that plans are being made to reopen the Mountain Iron mine, at Mountain Iron, Minn. Operations are supposed to start for the 1943 season. This iron deposit was the first iron discovery on the Mesabi Range. The first shipment was made in 1892, and until it was closed in 1908 17,199,104 tons were shipped from the property. At present the mine is a lake and a large pumping program will have to be undertaken to make it ready for operations. W. F. Pellenz, of Virginia, Minn., is general superintendent in charge of the district.

▶ After several years of idleness, the Princeton mine, of the Cleveland-Cliffs Iron Co., in the Gwinn district of the Marquette Range, has been made ready for production. The shaft has been changed to three compartments, two for in-balance skips and the third for a cage. A new headframe has been built. About 100 men will be employed. This is the only active mine in the Gwinn area.

▶ Tax valuation recommendations, submitted by Frank Pardee, valuation engineer for the State Tax Commission, increased Marquette Range valuations $880,000 over last year's figure, to $28,353,000. Recommendations for Menominee Range valuations were raised $661,000 to $13,105,000. Recommended Gogebic valuations were reduced $740,000 to $19,665,000 and Dickinson County was reduced by $105,000 to $1,601,000. After a hearing, on May 21 at Bessemer, Gogebic valuations on active mines were raised 5 percent above the recommended values.

▶ Trial was begun June 3, at Marquette, of the first collar-to-collar case to be tried on the iron ranges, in the claim of United Steel Workers of America, a CIO affiliate, against the Davidson Ore Mining Co. This is one of 17 similar cases pending, involving various operators, and is an outgrowth of the finding of the Wage-Hour Administrator that working time begins and ends at the collar of the shaft, not at the working place in the mine. In making such a finding, the Administrator upset established practice, and created a situation wherein a mining company which had been following established practice could not escape heavy liability, even though the custom was abandoned at the time of the announcement.

To Evaluate the Performance of a Screen

(*Continued from page* 61)

with line M_t, and α is the angle of the feed curve at its intersection with M_t.

These various relationships indicate quite clearly the effectiveness of a screening operation, and, after some practice, grading results can be predicted fairly closely when several curves of separation are known for any given screen.

[1] Handbook of Ore Dressing. A. F. Taggart. John Wiley & Sons. 1927.

[2] "Factors To Consider When Size-grading Granular Materials," Rudolph Kohn, *Food Industries*, McGraw-Hill Publishing Co., Jan., 1941. Also "How to Compare Industrial and Test Sieves." Rudolph Kohn. *Food Industries*, Feb., 1941. Also *Bulletin des Anciens Eleves de l'Ecole Francaise de Meunerie, No. 80*, Rudolph Kohn, June, 1939.

ARKANSAS

Zinc-Lead Mine Activity Expanding Rapidly

Manganese ore being stockpiled for beneficiation—Moark has good silicate orebody —Shepps building 100-ton zinc ore mill

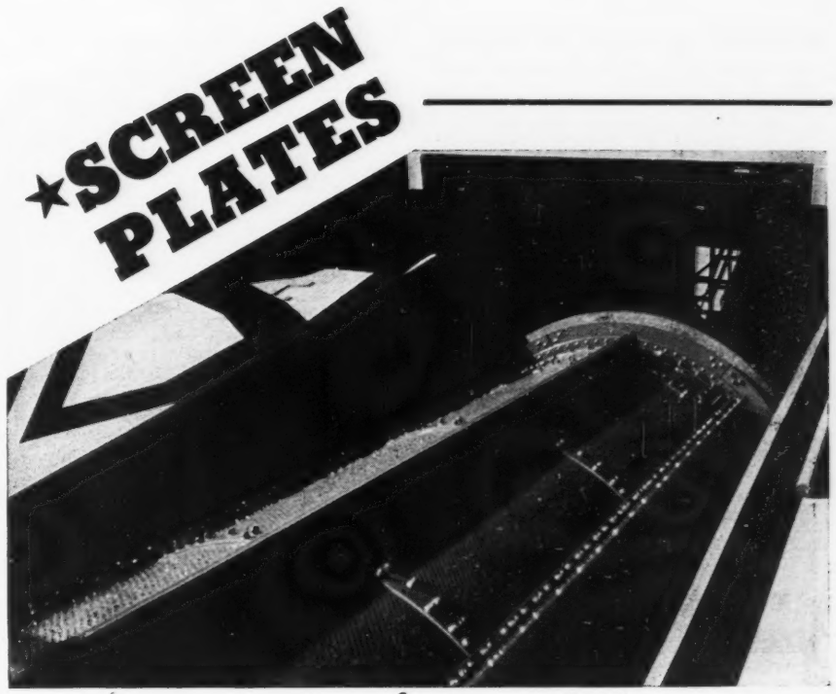
▶ Manganese shipments from the Batesville-Cushman Arkansas manganese field were practically confined to high-grade ore during the months of May and June. The low grades, especially the wad or soft black ore, are going into stockpiles which will be sold by the producers to the American Zinc Co. of Arkansas, which will soon build a manganese beneficiation plant in the field. A local ore market was opened by this concern the last of June. Offices have been opened in Batesville, Ark., by the new concern, with Robert Ammon, of St. Louis, as general manager. No reports as to the kind of a plant or its exact location have yet been released. Mr. Ammon could not say when work on the new plant would start, but stated that it would be built as fast as possible after plans were worked out. By the middle of June there was approximately 2,500 tons of low-grade in the stockpiles in Cushman, Pfeiffer, and at the mines. A big production of low-grade is now being made by all operators in the field to get the plant off to a good start when they begin operations.

▶ A. W. Estes, of Yellville, Ark., who has been contacting outside owners of mining land in the field, urging them to open their properties, reports good cooperation. Working with them, he will start on individual prospects and develop them to a sufficient degree to warrant construction of a milling plant. He has employed a force of local miners as field men to investigate each property. In a short time compressors, drills, and other equipment will be put to work to open up those properties where the geology and ore showings justify development.

▶ Moark Mining Co., operating the Gloria and Red Mill properties on land owned by the Almy estate in the Zinc, Ark., camp, has opened up some good bodies of silicate of zinc and has enough crude in sight to keep a mill operating several months. The company purchased an abandoned mill last month, but later it developed that the title was not good and the mill was not taken over. The company is now negotiating for another plant, and expects to have it operating on the property within several months.

▶ Edith Mine, at Rush, Ark., being operated by the Maricon Mining Co., has recently driven into some very rich zinc carbonate orebodies and has its mill running nearly all the time. It is producing a carbonate concentrate that runs 40 percent metallic zinc.

▶ Pat McCormack, foreman for the Shepps Co. at Rush, Ark., said on June 6 that the company has opened enough zinc ore to keep the 100-ton mill—under construction at the Leader Hollow mine for the past several months and ready for operation in two weeks—in operation for six months.



by Yuba for
LOWER COST YARDAGE

● On any dredge or screening plant, Yuba A.R.S.* screen plates *do* cut gravel screening costs. These tough, abrasion-resisting screen plates will add longer life to revolving screens—require fewer shutdowns for replacement—handle maximum yardage at low cost.

● Dredge operators in California were among the first to prove the cost-saving difference between ordinary steel plates and the rugged long-wearing A.R.S. screen plates developed by Yuba. Operators throughout the world now take advantage of the increased production and economies assured by these plates.

● Yuba A.R.S. screen plates were developed primarily for dredging. To meet the worst of field conditions, Yuba selects special steels for this severe service. To provide proper fits in the screen, Yuba plates are rolled true at the mill—cut square to close limits. Perforations are maintained on exact centers by specially designed drills, insuring correct diameter and properly tapered holes.

● Owners of many large and small dredges and washing plants are satisfied that Yuba A.R.S. screen plates save money. If you want longer life screen plates—fewer shutdowns for replacements —bigger yardage at less cost, consult Yuba before you buy.

** A.R.S.—Abrasion Resisting Steel, a high Carbon, high Manganese Steel with hardness averaging 230 Brinell.*

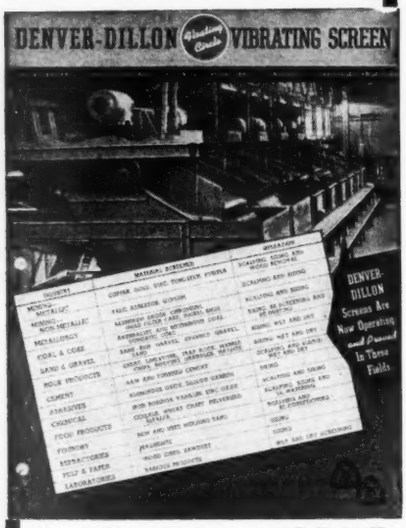
YUBA MANUFACTURING CO.
351 California St., San Francisco, California

YUBA DREDGES — PROVED DEPENDABILITY ROUND THE WORLD

Cable Address "YUBAMAN" SAN FRANCISCO *All Codes*

ALLUVIAL DREDGES, LTD.
55-61 Moorgate, London E. C. 2—*London Agent*

A NEW BULLETIN YOU WILL WANT

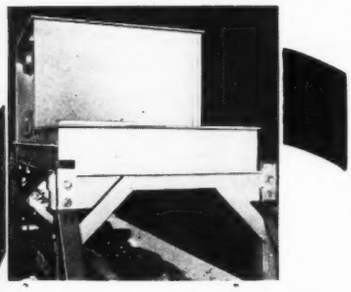


Write today for above new Bulletin No. S3-B3, Denver-Dillon Vibrating Screens have been proved by over four years of service in numerous industries. Operators report definite reduction in screening costs. "Floating Circle" principle requires less than half of the average power of other means of screening.

Denver, Colo., Deco Bldg., P.O. Box 5268
New York, N. Y.....50 Church Street
Chicago, Ill., Suite 1005, 69 W. Washington
Salt Lake City, Utah.....McIntyre Bldg.
Mexico, D. F.....Edificio Jalisco
Johannesburg, S. Africa...8 Village Road

DENVER EQUIPMENT COMPANY

MERRICK WEIGHTOMETER



AUTOMATIC WEIGHING WITHOUT PAUSE IN CONVEYING!

The Merrick Weightometer provides a continuous, automatic accurate weight record while material is in motion on conveyor. It weighs without interrupting conveyor service.

Applicable to any size belt conveyor, horizontal or inclined. An accurate and dependable means of keeping constant check on production.

Write for Bulletin 375

MERRICK SCALE MFG. CO.
PASSAIC, NEW JERSEY, U. S. A

CANADA

Gold Mines in Distress Over Supplies and Labor

Siscoe expanding base-metal activity — Lake Geneva now at capacity—Rush on in Romaine River country

▶ Appointed by the Metals Controller, a War Metals Advisory Committee has been set up for the purpose of planning new and increased production of strategic minerals. The first step is to be a survey of mineral possibilities, including low-grade deposits. Technical reports are to be prepared on all properties that show merit, and the Metals Controller will be advised on the cost and operating problems involved in bringing these into production. Full cooperation of mine operators throughout the Dominion is expected by the committee, which is composed of the following: Robert A. Bryce, chairman; Thayer Lindsley, A. A. MacKay, W. G. McBride, E. V. Neelands, Balmer Neilly, Leo H. Timmins, J. G. McCrea and D. H. McDougall. Seven other associate members represent each of the mining provinces. The committee is to act without compensation.

▶ A warning that gold mining faces a catastrophe unless action is taken at Ottawa was voiced by J. P. Bickell, president of McIntyre Porcupine Mines, at the annual shareholders' meeting. Not only has the development of gold prospects come to a halt, he said, but few experienced prospectors are now available. Many producing mines have passed the crest of productive capacity, and higher costs are reducing operating profits and shrinking available ore reserves.

QUEBEC

▶ The 300-ton mill of West Malartic Mines went into operation on schedule May 11, and the first bar was poured June 2. Under J. G. Woodcock, mine manager, production during the tune-up period has been satisfactory. Development work on several levels has been resumed, including an exploratory drive to the east boundary on the fifth level along the strike of the No. 3 vein. A program of lateral diamond drilling is to be started.

▶ Early production is to be secured from the property of the Molybdenum Corp. of Canada, north of Val D'Or. The president of Wartime Metals Corp., Jules R. Timmins, has announced that Siscoe Gold Mines will operate the mine on a royalty basis for the government agency. Development work 15 years ago led to ore estimates of 40,000 tons down to the 250-ft. level. Lateral work of about 3,000 ft. has been done on two levels.

▶ By increasing mill capacity to 1,000 tons a day at Siscoe, recovery is running slightly higher than a year ago in spite of the lower grade now being mined. The president, J. B. Lynch, reports that drastic reduction in working costs to $3.30 a ton has increased the life and development possibilities of the mine. Activity in the search for war materials has led to the organization of the subsidiary Siscoe Metals, with Andrew H. Robertson as general manager. Expansion in the base-metal field includes operation of the molybdenum mine in LaCorne Township and the Tetreault zinc-lead mine at Montauben, 50 miles northwest of Quebec.

▶ No. 1 orebody in the east section of Malartic Gold Fields has disclosed a new shoot that is wider than any ore yet found. Drilling on the 1,200-ft. level has traced a 200-ft. length having a maximum width of 65 ft. with a grade of $9.62 a ton. Development work down to 1,350 ft. has indicated ore conditions in line with the upper horizons. The mine manager, R. Halet, reported 1,500 tons per vertical foot in the No. 1 zone above 575 ft. An upward revision of ore reserves may result from the newly discovered ore shoot. No. 2 orebody, in the west part of the property, is being opened up on the first level at 175 ft. No. 2 shaft has reached a depth of 300 ft., and the main haulage level to connect the two shafts at the 1,200-ft. horizon has advanced 1,350 ft., with another 1,700 ft. to go.

▶ Hollinger Consolidated Gold Mines has acquired control of the Labrador Mining & Exploration Co., which holds a 20,000 sq.mi. mining concession in Labrador embracing a pre-Cambrian area known to be mineralized but largely unexplored. The concession includes five major iron-ore deposits which are sufficiently developed to indicate about 75,000,000 tons of high-grade ore. Some parties believe that this area may eventually become one of the great iron-ore producing areas of the world. The concession contains a power site at Grand Falls on the Hamilton River estimated as capable of developing from three to five million horsepower.

▶ A considerable rush of prospecting is taking place into the Romaine River area, which was recently opened for mineral development. Copper assays exceeding 4 percent have been reported, and ilmenite orebodies are known which may prove to be commercial. A geological investigation was conducted in the area last year under the direction of Dr. J. A. Retty.

ONTARIO

▶ The 100-ton concentrator of Lake Geneva Mining Co., 40 miles northwest of Sudbury, is now running at capacity on zinc-lead-gold ore. For the first six months after reopening the property last July only 50 tons a day could be averaged from development ore in opening up stopes, leaving a net loss for the period of $48,656. The shaft has been deepened to 335 ft. and the third level is being opened at that horizon. Substantially higher prices are now being paid for the mine output than at the start of operations. Controlled by Towagmac Exploration, Lake Geneva has as president Col. C. D. H. MacAlpine, and A. A. MacKay, Leo H. Timmins, and the Hon. Onesime Gagnon are directors.

▶ Omega Gold Mines, although hard hit under present conditions as a marginal producer, is to continue in operation so

Polaris-Taku mine, Tulsequah, B. C., has been forced to discontinue mining operations for lack of supplies and competent labor

long as gold recovery is sufficient to finance work. Angus D. Campbell, mine manager, reports that operating profit is about the same in the past two months as in the same period of 1941. New ore has been found and new extensions have been indicated by diamond drilling, with possibilities of finding more and better grade ore in the mine. Recovery last year averaged $5.16 and working costs $4.31 a ton.

BRITISH COLUMBIA

▶ The Hon. Herbert Anscomb, British Columbia Minister of Mines, in his annual report for the year ended December 31st, 1941, states:

"The value of mine production in 1941 was $78,479,719, an increase of $2,778,564 over 1940. This figure is somewhat below the actual figure, because the value of copper is based on the London price, whereas British Columbia copper is sold at the New York price. The increase is somewhat less than would appear by comparison with last year's annual report because the 1940 returns as published were $348,425 short of the final returns. The London price for copper is used so that value figures in the tables in this report will correspond closely with Provincial figures as published by the Dominion Bureau of Statistics. The Dominion Bureau uses the London price because most of Canada's copper is sold through London."

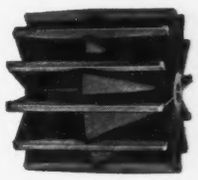
▶ Buccaneer Mines, Ltd., Bralorne subsidiary operating in the Bedweill River area of the Clayoquot mining division, has ceased milling operations. A small crew is mining high-grade ore at both the Buccaneer and the recently acquired Prosper group, ore shipments being made directly to the Tacoma smelter.

▶ Polaris-Taku Mining Co., Ltd., has closed both mine and mill at its property in the Atlin mining division and is now engaged in shipping the huge accumulation of concentrate to the Tacoma smelter. Walter B. Congdon, president, states: "We shall continue to ship concentrate as long as the weather permits. We have a considerable tonnage on hand and it will keep us hurrying. We will need a lot of good luck and a long season if we are to succeed in getting out all we have on hand. We have every intention of resuming operations when it becomes apparent that we can get supplies and transportation, not to speak of competent help, at the end of the war."

▶ During the fiscal year ended March 31, 1942, Pioneer Gold Mines of B. C., Ltd., Lillooet mining division, produced 51,829 oz. gold and 9,369 oz. silver, valued at $1,998,856, from 110,405 tons of ore milled, averaging 0.483 oz. gold per ton. Development during the year amounted to 6,672 ft., made up of 1,021 ft. of crosscutting and drill stations; 2,439 ft. of raising; and 3,212 ft. of drifting. The drifting included 2,357 ft. of work on the "27" vein, 792 ft. on the "J" vein, and 64 ft. on the Main vein. Ore reserves as of March 31, 1942, were estimated at 276,503 tons, averaging 0.418 oz. gold per ton, compared with 369,130 tons, averaging 0.415 oz. gold per ton, a year ago. As the tonnage mined was 126,407 tons and an additional 21,359 tons of low-grade material, not commercial under existing conditions, was taken out of the reserves this year, the actual ore developed, therefore, amounted to 55,109 tons. Dr. H. T. James, managing director, states: "Earnings from the year's operation at the mine were all that could be expected, but the unusually large write-offs on exploration account have reduced the net profit for the year to $382,260. A large part of the write-offs would not have been necessary under normal conditions —at least not at this time—but under existing conditions options on gold properties, carrying definite commitments, are liabilities rather than assets." The quarterly dividend rate has been reduced from 10c. to 8c. in anticipation of increased labor shortages and the desirability of spending a larger amount on development work at the mine. A determined effort has been made to recover scheelite both from the ore milled and the tailing. Directors have volun-

BELTSAVER

THE EXCLUSIVE MONARCH



Wing Type

TAIL PULLEY SAVES

ELEVATOR AND CONVEYOR BELTS

"Beltsaver" is as far ahead of the open face pulley as a B-19 Bomber is ahead of the "flying piano boxes" of World War I. "Beltsaver" is especially recommended for use as an elevator boot pulley on conveyor tail pulley when handling sand, gravel, stone, ore, ashes, coal and similar sharp, abrasive materials. Users report belt life increases of from 50% to 100% over that which they obtained when using a solid face pulley. "Beltsavers" are made in standard sizes and are interchangeable with solid face pulleys.

COMPARE:

Ordinary Type Solid Face Pulley

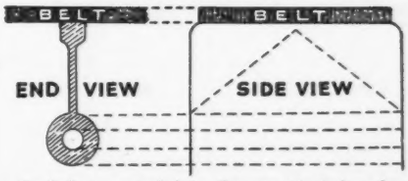
. . . in the under side of the solid face pulley causing extensive damage.

WITH "BELTSAVER"

Wing Type Tail Pulley

ONLY 20% OF PULLEY PERIMETER TOUCHES BELT

Note the cross sectional end and side elevators. End view of rounded wing (Left Below) shows contact with belt. Face surface of these wings is wide enough to pull without harm to belt, and because they represent less than 20% of the total pulley perimeter, "Beltsaver" offers less than 1/5 the wearing surface of an ordinary solid face pulley. Note the exclusive wing and cone design of "Beltsaver" provides runways which allow material to escape—thus preventing



its being pressed into the unprotected under side of the belt—causing abrasion and serrations.

"BELTSAVERS" are made in standard sizes and are interchangeable with regular face pulleys. Send for data sheet with complete diameters, sizes, faces, and prices.

SPROUT, WALDRON & CO.

175 Sherman St. Muncy, Pa.

Designers, Engineers, Manufacturers
Since 1866

Recognized Universally
as the ULTIMATE in
Valves and Couplings

KNOX
MANUFACTURING CO.
812 CHERRY ST., PHILA, PA.
Since 1911 Producers of

KNOX
Valves-Couplings-Nipples-Clamps-Menders

Need Protection for Overhead Welding?

Few helmets... regardless of protection... offer greater comfort than the Walker Welding Helmet. Protection is provided for complete head and neck, with no possibility of backflash. Other models include fibre helmets, goggles, etc., all described in condensed folder. 18-7

Many Other Models Described

E. D. BULLARD COMPANY
275 Eighth Street
San Francisco, California.
Everything BULLARD in Safety

Send me free condensed folder describing welders' protective equipment designed to meet today's specialized needs.

Name _____
Address _____
City _____ *State* _____ EMJ

NATIONWIDE SALES AND STOCKS

▶ CANADA

tarily reduced their fees from $1,000 to $500 annually and the stock has been delisted from the New York Stock Exchange in a move towards retrenchment.

▶ Shareholders of Ymir Consolidated Gold Mines, Ltd., have approved a proposal whereby the 125-ton flotation mill of the Ymir company will be moved to the Mayflower group at Rossland in the Trail Creek mining division. The Mayflower company has been negotiating with the Metals Reserve Co. of the United States government with respect to disposal of lead and zinc concentrate should the property commence production.

▶ During the fiscal year ended Feb. 28, 1942, Kootenay Belle Gold Mines, Ltd., produced 9,873 oz. gold and 2,608 oz. silver, valued at $377,600, from 35,292 tons, averaging $10.70 per ton. Actual operating loss was $5,260, but after provision of $19,846 for depreciation and depletion, and $5,819 for taxes, the net loss for the year was $30,925. Three dividends, totaling 6c. per share and amounting to $40,512, were paid from earned surplus. The company has now paid in all $370,360 or 55c. per share. Net current assets at the close of the fiscal year stood at $179,013, or 26.5c. per share. Ore reserves as of May 1, 1942, were estimated at 8,917 tons, averaging 0.21 oz. gold per ton. J. L. Trumbull, vice president, states: "Due to unfavorable results, all development work on the property has been discontinued. Plans have been made to mine the remaining ore reserves. From Feb. 1 to May 1, 10,493 tons, with a net profit of $35,000, were mined." Shareholders have authorized directors to obtain a base-metal property, if possible.

▶ May production of Surf Inlet Consolidated Gold Mines, Ltd., in the Skeena mining division, was 804 oz. gold, valued at $28,085 (U. S.) from 2,790 tons, averaging 0.321 oz. gold per ton.

YUKON TERRITORY

▶ During the fiscal year ended Dec. 31, 1941, the Yukon Consolidated Gold Corp., Ltd., largest Canadian placer operator, recovered gold valued at $2,336,708, compared with $2,621,256 in 1940. Operating profit was $581,469, compared with $769,806 in 1940. An earlier start than usual has been made in 1942, and all dredges except one were in operation by May 1. Following the ample snowfall experienced last winter, the future appears more promising than a year ago. This year it has been decided to undertake no further prospecting on the company's ground, but instead to assist the Dominion government authorities in every possible way in the search for needed war minerals in Yukon Territory.

▶ Following the issuance of the certificate of dissolution on May 5, 1942, by the Secretary of State of Delaware, the Treadwell Yukon Corporation, Ltd., is now legally dissolved and in a position to distribute the available capital assets. An initial payment of 5c. per share (U. S.) was made on June 15.

MEXICO

Conditions Improving for Mining Industry

United States subsidies encourage activity —Government striving to reduce labor troubles, sabotage, and transportation difficulties—mercury production up

▶ Conditions in Mexican mining have definitely improved with the settling down to more and better work as a result of American financing that has been arranged, and the all-out war effort of the Mexican government. But there is still a lack of smoothness in the industry. There was the strike against Moctezuma Copper, a tieup that had a detrimental effect upon this country's red metal production, and dissension in the national miners' union.

▶ Mines and mining properties are being accorded special vigilance and protection in the government's intensification of its campaign against activities of the fifth column. But a fire, attributed to sabotage, did considerable damage to La Prieta mine, the most important of American Smelting's Parral unit, Chihuahua. There have also been mystery wrecks of several freight trains carrying explosives and other essentials for mining.

▶ The federal and state governments are pushing their program for the construction of roads to serve mining zones and the reconditioning of existing highways in those areas so as to afford more and better transportation facilities. The National Railways is beginning to render mining better service (the industry is one of this important railroad's greatest customers) and has announced a wartime efficiency service, featuring the maximum use of rolling stock, particularly freight, with full loadings of cars and prompt unloading. The National Railways are placing into service as soon as they are delivered the locomotives and other vital items of rolling stock that it is obtaining from the United States.

▶ Bandits recently perpetrated a fruitless raid on mines at Esperanza, near Guanajuato City. The opportune arrival of soldiers forced the raiders to abandon a large sum of money and a considerable amount of tools they had stolen, and seek refuge in a forest.

▶ Oliver Kendall is in Mexico City arranging labor and money facilities for expansion and intensification of work at his Los Lavaderos and Artemiza zinc-lead mines, San Luis, Sonora. He reports that Sonora zinc-lead mining has started to boom.

▶ American Smelting is preparing to resume and intensify work at the old Aurora mine, between Zichu and San Luis de la Paz, Guanajuato. The plans include arrangements with the state government to modernize the road to Zichu. This work was scheduled to start early in July.

▶ Cia. Minera de Santa Maria del Oro, S.A., Magistral del Oro, Durango, which recently resumed operations after a five-year suspension because of labor difficul-

ties, is arranging to found a hospital for its workers. The Durango government pledged the company freedom from work difficulties.

▶ The federal Board of Conciliation and Arbitration declared legal the strike against Moctezuma Copper, Nacozari, Sonora, that began May 21 to enforce demands for a new contract entailing a 15 percent pay increase which the company contended it could not afford to grant. This strike was called in strict accord with the law and the majority of the workers voted for it, the board ruled. The strike is now settled.

▶ Cia. Exportadora de Metales, S.A., Madero, 17, Mexico City, a metal-exporting company, is suing the federal government in the first district court, Mexico City, in connection with the alleged near-confiscation of 5,800 kg. of lead it had taken to Tampico for shipment. The company also wants the government to pay 28,000 pesos ($5,850), which it claims it spent for gathering and freighting the metal. The company asserted that, without giving a reason, the Ministry of National Economy seized this lead and brought it to Mexico City for storage and refuses to release it, although all this metal is consigned to the United States.

▶ Things are not going smoothly for the miners' union. This trouble began at a violent meeting of members of its section composed of employees of Cia. Minera Real del Monte y Pachuca, S.A., Pachuca, Hidalgo, held there. Executives of this section were accused of mismanagement and fraud, specifically that they had devoted 70,000 pesos ($14,500) of the section's money to build a headquarters edifice, then had discarded this building; also, of making loans, large and numerous, without consent of the members. The meeting voted that the Real del Monte workers join with members of the San Rafael and Dos Carlos cooperatives, also of the Pachuca sector, to form an organization separate from the union.

Next developed dissension among the leaders of the union itself when 142 of the 159 sections at the third national convention in Mexico City voted against the proposition that the union be placed under the control of the National Proletarian Confederation. That rejection brought about the election of a new executive committee, Juan Manuel Elizondo, chairman, with the original committee, headed by Jesus Carrasco, continuing to function with the 17 dissenting sections as its group. The majority has asked the Labor Ministry to recognize only the Elizondo committee as its representative in the making of all future contracts with the mining interests.

▶ A mining concession in the Promontorio district, Durango, received some time ago from the Cia. Minera y Explotadora de Promontorio, S.A., has been abandoned by a cooperative society formed by members of Section 89 of the miners union. The society, which had been in difficulties for some time from flooding of the mines and lack of equipment, was forced to quit because of the impossibility of obtaining funds. Last year, the federal government made this cooperative a grant of 15,000 pesos ($3,150).

Why continue to cut and bow wire rope, weakening the strands, making serious accident possible?

Use the Safety Clip. It can't be put on wrong — inexperienced workers can't cause the dangers of the U-Bolt put on backward. The Safety Clip takes a powerful, all-round Fist-Grip on rope. The four flat bearing surfaces far out-hold the finger-pinching U-Bolt Clip, and cannot crush and crimp wire rope.

The Safety Clip Gives More Steel for Armaments!

25% less steel is used in a Safety Clip assembly equal in strength to a U-Bolt-held rope. That steel can go to arsenals and plane factories for all-out military needs. Fewer clips are needed — that saves steel, too. And the rope-ends stay straight and round for re-use — no expensive waste from cut-off crimped-up rope ends.

THESE ARE YOUR SAFETY SAVINGS

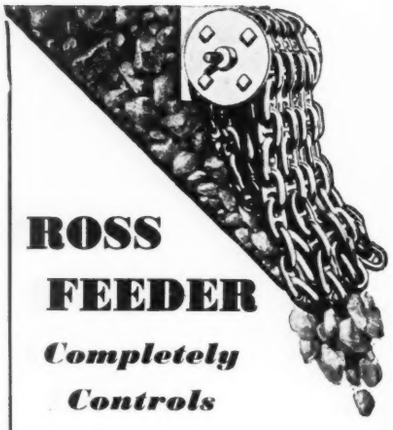
No rope crimping or bowing	rope saved
No special wrench	tools saved
Bolts on opposite sides	tightening time saved
Can't go on wrong	accidents saved
Fewer clips needed	clips saved
Fewer rope breaks	accidents saved
No bent, battered threads	clips saved

95% rope strength delivered by test.

Distributed exclusively through Mill Supply Houses

Look for Laughlin Products in *Metal & Non Metallic Mining Catalog*

THE THOMAS LAUGHLIN COMPANY
PORTLAND, MAINE



ROSS FEEDER

Completely Controls

the flow of any size material from Storage Bins, Hoppers or Open-Dump Chutes to Crushers, Conveyors, Screens, etc.

High in efficiency. Low in maintenance and power consumption.

Furnished in sizes to suit your operation. Scalping unit to fit your chute if desired. Send full particulars for recommendation.

ROSS SCREEN & FEEDER CO.

19 Rector Street
New York
U.S.A.

8 Victoria Street
London, S.W.1
England

SAUERMAN

POWER SCRAPER
Because of its streamline design, a Sauerman Crescent scraper penetrates hard materials with the ease of a plowshare, and both in digging and hauling it requires much less line pull than any other scraper of equal capacity. It digs a heaping load in a few seconds, moves this load rapidly over the ground, dumps cleanly when it reaches the dumping point, and then returns at high speed to dig another load.
Write today for catalog and see for yourself how others are saving money by using Sauerman scrapers for all kinds of excavating, stockpiling and material-handling jobs.

SAUERMAN BROS., INC.

584 S. Clinton St. Chicago

BOLIVIA

Important Tungsten Producer Starting

South American demand booms sulphur mining—Molybdenum and bismuth developments—Mining industry worried over equipment and supplies

▶ The Pacuni wolfram mine, located in the rich Quimsa Cruz district, which contains several tin and tungsten mines, formerly belonged to the Guggenheim's Caracoles Tin Co. of Bolivia. It is now under the ownership of Compagnie Aramayo de Mines en Bolivie, and is being prepared for large-scale production. The deposit consists of two veins of importance, carrying mainly wolframite, with some cassiterite and pyrite. Since its beginning prior to World War I, it has been mined and beneficiated by hand methods. In 1937 an intensive program of development and preparation got under way, the Caracoles tin concentrator being adapted to treat this ore.

▶ With the increasing demand for sulphur for consumption in Argentina and Brazil, which under current conditions have to depend almost entirely on the output of Bolivia and Chile, and with the price having been nearly doubled during the past year, there is a great incentive to increase production, which by all indications will surpass in 1942 the total of nearly 25,000 tons produced in 1941.

▶ Concepcion, on the Bolivian side of the border, is now producing 1,800 tons of sulphur per year. With the addition of a new autoclave of 4.5 tons' capacity, and all its installations working full time, inside of six months it should be able to produce about 15,000 tons per year. San Pablo de Napa, today the principal Bolivian producer of sulphur, is planning to build a new section of retorts.

▶ Late reports are that a molybdenum deposit has been discovered at the foot of Illampu Peak, in Condor Huta, about 180 km. by auto road from La Paz. The mineral is molybdenite in an impregnation deposit. Exploratory and development work, it is claimed, has already shown a few thousand tons of 12 percent mineral. In the same region, 12 km. from the molybdenum deposit, there are some narrow but rich veins of bismuth sulphide. A hydroelectrically driven flotation plant to treat the ore will be put into operation this month.

▶ With Banco Minero de Bolivia having practically all of the capital at its disposal tied in stocks of concentrates for export, in this hour of need for strategic minerals many mines run by small operators, given adequate capital, could increase production substantially. Great interest is shown in the promised United States help to the Bolivian mining industry. The chief of the United States Economic Mission to Bolivia, Merwin L. Bohan, is already back in Washington with the reports made by the specialists who surveyed diverse economic aspects of the country and planned the promotion of the various industries.

PERU

Larger Zinc-Lead Output Expected

Supply problem causes worry — BEW investigating mineral resources — Mercury production increasing

▶ Mining companies, which generally carry small inventories, are somewhat concerned over the problem of supplies. Most important items on the supply list are grinding balls, drill steel, crusher plates, spare parts for drilling machines, and electrical equipment.

▶ Compañia Minera Tauca, S. A., controlled by Peruvian and Swiss capital, has completed the erection of its 25-ton gravity concentrator at Ogopita, in the Department of Ancash. The plant is now treating tungsten ore containing 1½ percent WO_3.

▶ A number of small lots of mercury are begining to appear in the Lima market, and the local consumers are fairly well supplied. It is estimated that the potential production of quicksilver from the small miners is about ten flasks per month. If the Santa Barbara quicksilver mines, near Huancavelica, important in the colonial period, resume operations, Peru may be one of the important mercury-producing countries of the Western Hemisphere.

▶ Compañia Minera Rescate, S. A., at Quequeña, near the city of Arequipa, closed down in May, due to the exhaustion of its ore reserves. This property is equipped with a 300-ton flotation plant which produced copper-silver-gold concentrates.

▶ Copper production is proceeding at the usual rate, but current trends indicate that there will be some increase in the production of lead and zinc during the current year. Mines which will produce zinc concentrates for the first time in 1942 are: Sindicato Minero Rio Pallanga, Compañia de Minas Vercapuquio, Minas de Colquijirca, and Sindicato Explotador Sacracancha, in addition to the old established producers, namely Cerro de Pasco Copper Corp., Compagnie des Mines de Huarón, Anglo-French Ticapampa Silver Mining Co., and Compañia Minera Atacocha. Since the only zinc reduction plant in Peru is that of the small pilot plant at Oroya, belonging to Cerro de Pasco, zinc concentrates are all exported to the United States. Lead smelting and refining capacity of the Cerro de Pasco Copper Corp. plant is about 4,000 short tons of refined lead per month.

▶ The Peruvian government, through its Ministerio de Fomento, authorized on May 2 the construction of a standard-gage railroad from Pachacayo, on the main Central Railroad, to the town of Chaucha. This is in connection with the Cerro de Pasco Copper Corp's. new mine at Yauricocha. The railroad will be 75 kilometers in length. From Chaucha, an aërial tram, 13 900 meters, will run to the mine. Yauricocha, which carries high values in copper, will thus be in production in the near future.

▶ Panaminas Incorporated is in process of erecting a 20-ton Gould rotary mercury furnace, as a test plant for the company's mercury holdings at Chonta, in the Department of Huanuco. Ten tons of heavy machinery have been flown in by the Faucett Airlines, there being no highway communications to the property.

▶ The American engineers working under the B. E. W. in Peru have been investigating strategic and critical mineral deposits in the republic, including vanadiferous asphaltites, tungsten, and antimony. The asphaltite deposits, of widespread occurrence in the Central Sierra region, have been worked on a small scale basis for many years. These asphaltites carry approximately 0.5 percent of V_2O_5. Vanadium has been recovered by burning the asphaltites in small home-made reverberatory ovens. The resulting ash, which contains from 5 to 15 percent V_2O_5, is then exported.

BRAZIL

Preparations Being Made to Export Iron Ore

Government building shipping facilities—Large ore reserve known—Gold production off slightly

▶ Lode-mine gold production decreased slightly last year. Exploitation of large iron mines will start soon. Production of gold from lode mines last year was slightly under the 1940 level. Production reached 147,304 oz. against 149,811 oz. in 1940. Eight lode-mining companies were in operation. St. John d'El Rey Mining Co. produced 123,108 oz., Cia Mina da Passagem 13,613 oz., Mina Timbutuva Ltda. 4,603 oz., Cia Brazileira de Mineracao 2,899 oz., Minas Leao Junior Ltda. 2,691 oz., Cia Mineracao de Apiai 222 oz. and Soc Mineracao Machado 168 oz. The Morro Velho mine, operated by St. John d'El Rey Mining Co. continuously for more than a century, produced last year 83.6 percent of total Brazilian lode-gold production. The newcomer, Cia Mineracao de Apiai, operated a few months, closing down the mill at the end of the year. No data are available on placer gold production.

▶ The Export and Import Bank has agreed to lend $14,000,000 to the Brazilian government to subsidize exploitation and organization of shipping facilities of iron ore from the mines of Itabira region, northeast Minas Geraes. The ore will be hauled by rail over the Victoria-Minas railroad to the harbor of Victoria, Espirito Santo, where special loading bins and docks are being constructed. Reserves of several million tons of high-grade hematite ore are known to exist, but as a consequence of lack of transportation, exports have been negligible in the past. The government organized recently the Companhia do Vale do Rio Doce that will exploit the iron mines to ship ore to the Metals Reserve Co. and to the British government. The loan granted by the Export and Import Bank is to be paid by the ore shipped in the following years.

P·S·C CARS

Speed Up War-Time
METAL MINING

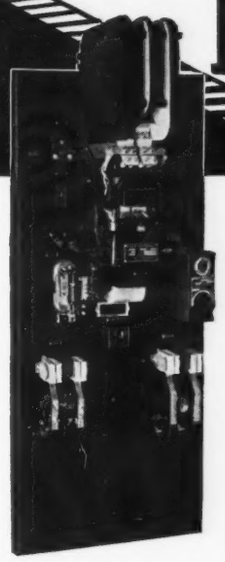
With sturdy, high-capacity P·S·C Cars on the job, there are no frequent time-outs for repairs or over-hauling. These sturdy, quick clean-dumping cars are designed and built to withstand the rigors of war-time's triple-shift production.

Our Bulletin 71 describes the complete line of P·S·C Cars—do you have a copy in your files?

P·S·C

PRESSED STEEL CAR CO., INC. · PITTSBURGH, PA.
(INDUSTRIAL DIVISION)

YOU'RE AFTER PEAK PRODUCTION



Type KSA Circuit Breaker for substation service

Automatic Reclosing Circuit Breakers Provide Efficient Substation Operation

Efficient substations mean more production by eliminating time losses resulting from disturbances on feeder circuits. This is true of the semi-automatic station which is attended only in starting and stopping and of the full-automatic station which requires nothing but rare, periodic attendance.

I-T-E has had more experience in the application of d-c circuit breakers in mining distribution systems than any other group, and our engineers will be glad to tell you how we can aid production.

Our plant, busy as it is with direct war effort in the building of switchgear, has capacity for prompt action in meeting the demands of the vital mining industry.

Representatives in Principal Mining Areas

I-T-E CIRCUIT BREAKER CO.
PHILADELPHIA, PA.

AFRICA

Rand Gold Production Continues to Mount

Greater output yields less profit—Large ore reserve foreseen for Rand—Mines curtailing consumption of materials

Despite a large portion of the white employees having been called to the colors, South African production of gold is continuing to increase. April production at 1,182,678 oz. was 31,452 oz. smaller than in March, and working profits at £3,646,712 were down by £101,310; but the average of both for the 30 days of April was higher than for the 31 days of March. There was a slight decline in the number of natives employed in March and again in April. W. H. A. Lawrence said at the meeting of Rand Mines that last year's production of the Witwatersrand and extensions was 14,039,912 oz. of gold, an increase of 356,494 oz.; but as a result of the general increase of working costs the working profit had fallen by £1,680,144.

▶ Evidently the expansion of activities since the rise in the price of gold has awakened interest in the prospective future life of the Witwatersrand mining district. The estimates of two engineers are presented in contrast in a recent report of the Industrial and Agricultural Requirements Commission. The government mining engineer estimates potential ore reserves above a workable depth of 8,500 ft. as 1,000,000,000 tons—2¼ dwt. and up, averaging 4 dwt.—and calculates that the annual tonnages milled, now about 66,000,000 tons, will have declined to 9,100,000 tons by 1965. But H. R. Hill, of the Union Corporation, thinks potential ore reserves are 1,600,000,000 tons, and he expects a less rapid but nevertheless marked decline in tonnage output between 1946 and 1969.

▶ One of the oldest producers in the district, Simmer & Jack, has been having a run of bad luck—caving in the upper areas, a series of rock bursts, winding accidents, and breakdowns. Production was restricted by these operators during the latter half of the year, and instead of being overcome they persisted during the first four months of this year, particularly in February and April. The results of new development, nearly 7,000 ft. per month last year, have continued satisfactory. It is proposed to increase development to 8,000 ft. per month this year. "Given freedom from further disorganization of operations," the chairman says, "the outlook for the future of the mine remains encouraging." He declared, too, that the increase in working costs had been mainly due to the higher cost of stores.

▶ East Rand Proprietary reports good progress the past year on the installation of air-cooling equipment. Capital expenditure of £82,312 last year was principally on this account. It is needed, as heat has made development at depth on the richer portion of the oreshoot almost impossible. Values opened on the east and west have been disappointing. Ore reserves are large, 10,245,500 tons averaging 4.8 dwt. over 58 in.

▶ City Deep's working profit last year was £835,117. Dividends took £408,750 of this and taxation £410,516. Development came to 63,274 ft., an increase of 3,334 ft.; but it is now being curtailed. Ore reserves increased, being now 4,113,900 tons averaging 5.2 dwt. over a stoping width of 43.3 in. Difficulty is being experienced in obtaining supplies, particularly imported supplies (not only by this company but by all others) and it is to conserve supplies, especially of steel, that development work is being curtailed. Quarterly reports to shareholders are being discontinued to save paper.

▶ Crown Mines earned £3,507,687 last year, and paid £1,461,747 in dividends and £1,970,692 in taxes. Developments on the main reef continued satisfactory, but on the south reef disappointing. Available ore reserves at the end of the year totaled 19,518,500 tons averaging 4.8 dwt. over stoping widths of 43.3 in. Necessity of conserving supplies is causing development to be diminished. Delayed deliveries of supplies caused plant alterations and extension to be held up. W. H. A. Lawrence says the problem of obtaining supplies of materials essential to maintenance of operations is increasingly difficult.

▶ New Machavie Gold Mining is discontinuing deep development, values there being uneconomic. New openings will be made in the upper levels of the Buffelsdoorn mine in the hope of finding additional reserves. Recent investigations, the management states, indicate a short additional life for the mine at the present rate of extraction. The mine is in the Klerksdorp section of the Witwatersrand.

▶ Durban Roodeport Deep increased its ore reserves by 1,082,500 tons last year, to 7,881,800 tons averaging 4.4 dwt. over 54.4 in. The width is increased 1.9 in. and the grade is unchanged. Of last year's profit of £1,229,795 dividends absorbed £406,875 and taxes £638,551.

▶ Adjustment of milling operations to available supplies reduced the daily crushings of the Geita Gold mine of Kentan Gold Areas, Ltd., to 350 tons, against an average of 496 tons the preceding six months. This increased costs to 32.48 shillings per ton. Developments at increasing depth are continuing highly satisfactory.

▶ Roan Antelope has declared an interim dividend of 3 pence per share, the same as a year ago. This company is selling its copper to the British government for nearly £20 per ton less than the current market price to help the war effort, and it gets no concession in taxation.

▶ Luipaards Vlei has decided, as a result of the campaign to save steel, to suspend operations on the 15,000-ton extension to its mill, which was well under way.

▶ The Nigerian Tin Mining Association, whose members are accelerating production, notes that this is accelerating the wear and tear of equipment and so has asked the government, which will take 100 percent of the profit arising from increased output, for a larger allowance for this wear and tear.

Reflections from Washington

(*Continued from page* 78)

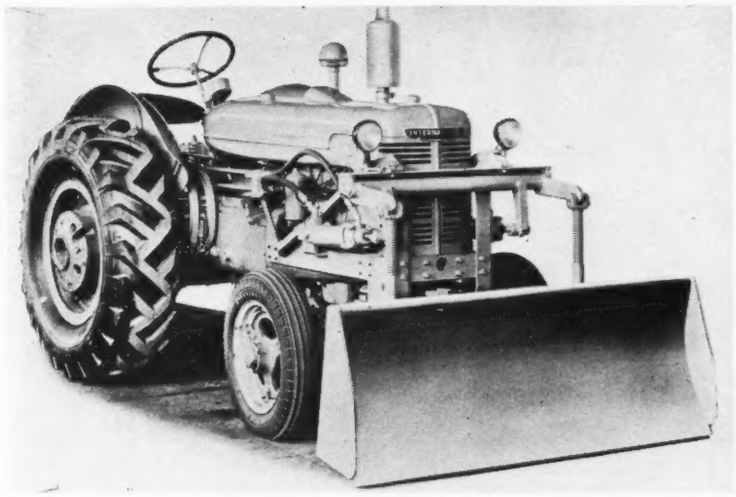
this year as an anti-inflation step. The committee rejected the Administration proposal that all incomes should be limited to $25,000 a year. The Administration's case was not aided by the hot resentment aroused in the committee when Secretary Morgenthau undertook to instruct it in its duty over the radio.

Included in the tax bill was a provision permitting consolidated returns for normal tax purposes (a similar provision already exists with reference to excess profits), but exacting an extra tax of 2 percent on surtax net income if the option is exercised. The committee also recognized the long-standing grievance of the mining industry against the provisions that make initial elections on depletion binding for the life of a property by approving an amendment offered by Representative Disney of Oklahoma, permitting annual elections on depletion options. The committee also approved another provision important to mining, by exempting premium payments for over-quota production from excess profits taxation. However, it is too early to make definite assumptions in regard to tax liabilities, as it is generally conceded that the Senate Finance Committee is planning a thorough overhauling of the bill after it passes the House. Nevertheless, considering both Congressional and Administration apprehensions over elections, it seems likely that the final bill will not realize the initial amounts urged by the Treasury and will have to be bolstered by a sales tax after elections.

News "Fines"

Price Headaches—When Leon Henderson took over the job of price boss, he prophesied that he would become the most unpopular man in the country. Recent events have tended to bear out this prediction. Congress, ever sensitive to public feelings, reflected the public inconsistency in wanting price control, but always at the other fellow's expense. In addition, some members were irked at Henderson's tendency to build his rapidly expanding organization on a merit basis, believing that the jobs involved should be treated as political largesse. Consequently, the Senate balked at Henderson's plea for legislation to permit subsidies for business firms caught between price ceilings and rising costs. Being denied wage control by a labor-minded White House, the only alternative open to the Price Administrator is a subsidy program, if price ceilings are to be effectuated. Late in June, Henderson proffered his resignation if Congress would enact subsidy legislation in return.

EQUIPMENT NEWS



Practical, Light Bulldozer

LIGHT, WHEELED TRACTORS may now be used for clean-up and shovel-feeding work in open-pit mines and in quarries, by means of the Baker "Baby" Bulldozer, a small-scale edition of the standard Baker Bulldozer. The new Model 282, shown attached to an International I-4 tractor, is hydraulically controlled and is powered by a Baker Rear-Power-Take-Off hydraulic pump unit. The blade, which is actuated by dual cylinders, is 24x66 in. in size, and can be lowered to take a 6-in. cut or raised 12½ in. above ground.

No trailer is required to move the Bulldozer from job to job, for the unit travels at high speed under its own power. It is said that large savings of fuel and up-keep costs may be made by using this small Bulldozer for jobs on which the use of a large tractor would be uneconomical. Complete details on Model 282 may be obtained from Baker Mfg. Co., Springfield, Ill.

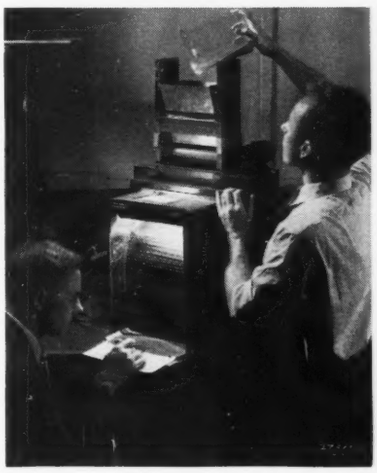
Analytical Balance

IN THE NEW analytical balance announced by the Thompson Balance Co., 808 20th St., Denver, Colo., the operating mechanism for releasing the beam is mounted outside of the case, leaving the space between the pans clear except for the index and pointer. The rod which lowers the beam slides in bearings supported by a rigid metal plate centrally dividing the rear glass, and the entire apparatus is easily accessible for oiling and adjustment.

Sensitivity of the balance is 1/20 mg.; the 6-in. beam is made of aluminum and contains 50 divisions on each side, one division indicating 1/10 mg. with a 5-mg. rider. The case is aluminum and the inside floor is of a new glass-like material. Agate bearings and steel or agate edges are used.

Graphite Additive Lubricant

KONAG "F," produced by National Graphite Co., 17 John St., New York, N. Y., is a suspension in lubricating oil of colloidal graphite which is said to reduce materially friction and wear in bearings in which it is used. Mixed with general lubricating oils, it forms a graphite skin on bearing surfaces, which are thereby preserved for longer operating periods.



G. W. Penney (left), and George W. Hewitt demonstrate their new electrostatic separator developed at Westinghouse Research Laboratories

Electrostatic Separator

ELECTROSTATIC SEPARATION has been applied to concentration of tin ores by a recent development of the Electro-Physics Division of Westinghouse Research Laboratories, Pittsburgh, Pa. Tested on Southern cassiterite ores containing 1.5 percent tin, the machine has produced concentrates carrying 70 percent tin and has secured recoveries as high as 95 percent.

The process depends on differences in electrical conductivity between the minerals to be separated. In tin ore, for example, cassiterite is a good conductor, but the gangue mineral is not. Ground to about 20 mesh, the ore is fed onto a metal drum revolving at a peripheral speed of about 1,000 ft. per minute. High-voltage charges are applied to the surface of the drum from a series of fine copper wires strung close to it and parallel with its axis. These charges are dissipated through the cassiterite particles but are held by the gangue; the cassiterite therefore falls immediately from the revolving drum, but the gangue is carried on around with the drum a distance sufficient to separate it from the tin mineral.

Only the laboratory model shown has been tested as yet, and no detailed operation figures are available. The ore is fed dry at a rate of ten pounds a minute, but it was not stated whether sizing of the ore is required before treatment. George W. Hewitt, electro-physicist, and G. W. Penney, manager of the Electro-Physics Division of Westinghouse, expect to continue the tests in an attempt to develop successful methods of commercial concentration of low-grade tin ores.

Emergency Burn Kit

WITH INDUSTRIAL ACTIVITY at an all-time peak, new importance attaches to provision for first aid, and the Bullard Emergency Burn Kit supplies an essential part of such material. Mounted in a neat wooden case, the unit contains equipment for prompt treatment of burns of all kinds, including a dispenser bottle which liberates a fine spray of tannic acid over burned areas. E. D. Bullard Co., San Francisco, Calif., manufactures this kit as well as many other similar articles.

Portable Air Compressors

ECONOMY OF OPERATION and lower maintenance costs are said to be features of the new line of portable air compressors recently announced by the Chicago Pneumatic Tool Co., New York City, N. Y. Both compressor and gasoline engine drive have been redesigned to provide increased air output per gallon of fuel, and to secure smoother, cooler operation at all speeds.

Increased valve and port areas are provided in the compressor, which, with cooler intake air and effective intercooling, are said to yield the full power saving that efficient two-stage compression affords. Improved design of the Hercules gasoline engine also contributes to a fuel economy which is said to insure 15 percent more air per gallon of gasoline at full load and up to 35 percent more air at partial loads.

Speed of the unit is accurately controlled by the new CP Gradual Speed Regulator, which automatically synchronizes compressor speed with rate of air demand and, in effect, anticipates conditions in the air receiver. Operation is thereby smoothed out and the wasteful-

ness of alternate full-load and idling compressor speeds is eliminated.

Seven models are built, covering an output range of from 100 to 500 c.f.m. of free air, and either the Hercules gasoline motor or a Caterpillar diesel engine can be supplied. Units are mounted on steel wheels, pneumatic tires, or skids.

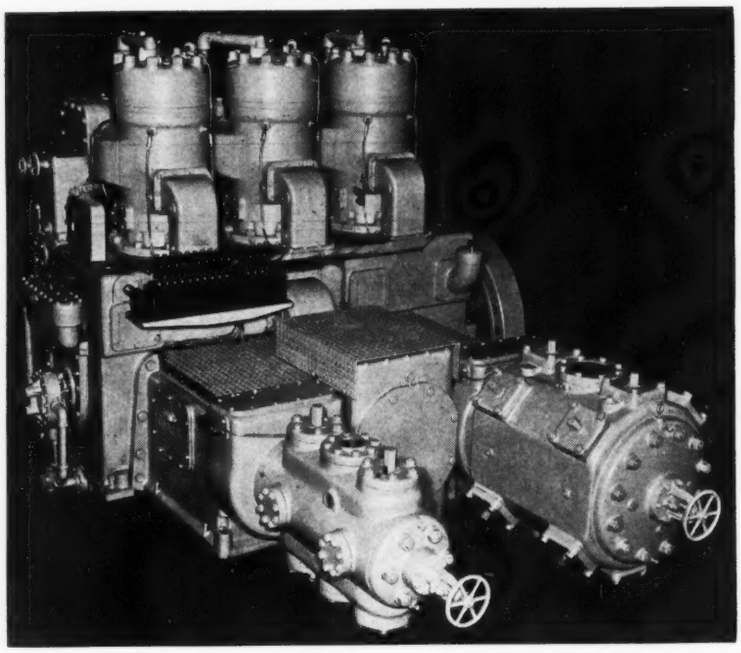
Process Control Stabilization

RE-ESTABLISHING NORMAL CONDITIONS following an upset in operations involving considerable process-lag is made easier by Hyper-Reset, a control function made available for use with the Model 30 Stabilog Controller supplied by the Foxboro Co., Foxboro, Mass. Tests have demonstrated the ability of Hyper-Reset to stabilize process disturbances in one-quarter of the time, and with one-half the upset effect, of similar controllers using the ordinary reset. Temporary initial corrections, proportional to the rate of change of measured values, reduce the effect of interferences, and normal operation is quickly restored. The theory of Hyper-Reset is fully explained in Bulletin No. A-330.

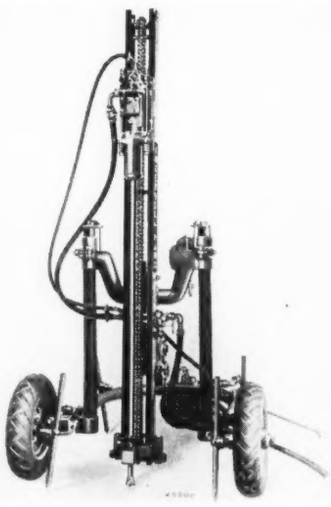
New Blasting Cartridge

MAXIMUM LOADING DENSITY is simply and rapidly provided for all blasting operations by the new Atlas Redi-slit cartridge. In use, each stick is loaded and tamped in the ordinary way and no tedious hand-slitting is necessary. When placed in the hole and tamped, the cartridge expands easily to form a tight fit in the back of the bore, and a neat, solidly placed charge is thus secured with a minimum of effort. Holes drilled overhead or in loose ground are easier to shoot, loading time is shortened, and blasting efficiency is improved. Further information on the Redi-slit cartridge can be obtained from the Atlas Powder Co., Wilmington, Del.

A new pure fused quartz ultra-violet generator announced by Pfaltz & Bauer, Inc., Empire State Bldg., New York, N. Y., is specifically designed for prospectors and mineralogists. In addition to the portable unit shown above, other laboratory and field models are available for use in identifying fluorescent minerals



Showing the Clark Super Two-Cycle Right Angle Compressor with diesel engine drive. The common crankshaft construction is said to furnish both installation and operating economies. Full information may be obtained from Clark Bros. Co., Olean, N. Y.



Improved Deep Hole Drill

ILLUSTRATED in the accompanying photograph is the new Ingersoll-Rand X-71WD Drifter drill fitted with the FM2 wagon drill mounting. The improved drill is said to have a heavier piston and a longer stroke than any other drill made today, features which provide the strong rotation and striking force necessary to overcome the inertia of heavy drill steel and extra-large bits. In addition, provision has been made for blowing more air down through the drill steel. Very little air is wasted around the shank and a strong steady current is directed to the bottom of the hole where it is needed. For more detailed information, write Ingersoll-Rand Co., 11 Broadway, New York City, N. Y., or any of its branch offices.

INDUSTRIAL NOTES

Copperweld Steel Co., Warren, Ohio, announces the appointment of **F. B. Davis** to manage the sales of its products in the Buffalo district.

William C. Johnson has been named general sales manager for Allis-Chalmers Mfg. Co., Milwaukee, Wis., to succeed **Walter Geist,** recently elected president. Mr. Johnson, formerly sales manager of the crushing and cement division, has been with Allis-Chalmers since 1924, when he began work as a helper in the shop. **Dr. Ellis E. Jensen,** formerly executive director for Wisconsin of the National Conference of Christians and Jews, has been employed as a research assistant in the industrial relations department of Allis-Chalmers.

All-Navy "E" awards for excellence in the production of war materials have recently been made to the following corporations: **Huntington, W. Va. Plant of International Nickel Co.,** for ordnance production; **DeLaval Steam Turbine Co.,** Trenton, N. J., propelling equipment and pumps; **Anaconda Wire & Cable Co.,** Marion, Ind., fifth of the Anaconda organization to receive the emblem; and **American Blower Corp.,** Detroit, Mich., for fluid drives and other special equipment.

International Nickel Co. has resumed work at Mellon Institute, Pittsburgh, Pa., by establishment of an industrial fellowship for research on the properties and uses of certain nickel compounds, especially organic derivatives. **Dr. John Gilbert Dean** is the present incumbent.

Chain Belt Co., Milwaukee, Wis., has appointed the following firms as distributors of REX construction machin-

ery: **Industrial Equipment Co.,** 1301 59th St., Oakland, Calif., will serve the San Francisco area, and **Sanford Tractor & Equipment Co.,** 500 E. 4th St., Reno, Nev., will cover the State of Nevada.

Handy & Harman, dealers in precious metals and fabricators of gold and silver for the arts and industries, are celebrating their 75th anniversary this year. Appropriate ceremonies were observed at banquets held at Bridgeport, Conn., and New York City, May 14 and 15. Service awards were made to all employees of more than ten years' service, and of the 68 to receive awards at Bridgeport, 14 were presented with gold watches in recognition of 25 years or more of service. To commemorate the anniversary, a souvenir booklet was issued, presenting interesting and pertinent facts about the organization, its facilities, products, and contribution to the war effort. The booklet will be distributed in the trades served by Handy & Harman.

D. M. Burgess, vice-president and general manager of **R. G. LeTourneau, Inc.,** Peoria, Ill., has devised a method of decreasing the crude rubber content of tires used on his company's Carryall Scrapers without affecting the load capacity of the machines. The new tires have been accepted by the WPB as standard equipment on all types and makes of heavy grading equipment, with an estimated saving to the industry of 1,500,000 lb. of rubber in the next year.

Donald C. Dallas, president of **Revere Copper & Brass, Inc.,** New York City, N. Y., recently presented two checks of $1,000 each to the Army and the Navy relief funds, the result of contributions of Defense Stamps sent in by Boy Scouts, Girl Scouts, school children, and others. Each contributor was given a set of colored prints by **Joseph Boggs Beals,** depicting the ride of Paul Revere, founder of the company.

John McG. King, manager of the Denver branch of **John A. Roebling's Sons Co.,** has announced his retirement after 37 years of service with the company. He will be succeeded by **Homer H. Davis,** who has been employed at the Denver branch of the Roebling Co. for the past 15 years.

Carboloy Co., Inc., Detroit, Mich., has further increased manufacturing facilities of standard Carboloy tools by equipping the tool department of a General Electric subsidiary in the Illinois region for their production. All standard sizes of tools are now available from stock, and special sizes and shapes may be had in less time than is current for steel tools.

Link-Belt Co., Chicago, Ill., announces the appointment of **Richard F. Bergmann** as chief engineer of the company, with headquarters at Chicago. **William W. Sayers,** chief engineer since 1925, will continue with Link-Belt as consulting engineer. Mr. Bergmann, assistant to Mr. Sayers from 1933 to 1936, returns to Link-Belt from his position as chief engineer of **Rayon Machinery Corp.,** Cleveland, Ohio.

Rogers Diesel & Aircraft Corp. recently changed its corporate name to **Cummins Diesel Engine Corp.,** with offices at 1120 Leggett Ave., New York City, N. Y. No reorganization has taken place, but the new corporate name is said to describe more accurately the nature of the company's business.

C. F. Pittman, formerly manager of the motor division of **General Electric's** industrial department, has been named assistant to the manager of the industrial department. **W. H. Henry,** who was manager of sales in the motor division, will succeed Mr. Pittman.

Foxboro Company, Foxboro, Mass., held a celebration on the evening of May 26 during which, jeweled service pins were presented to 50 men and women, each of whom have been employed by Foxboro for 25 years or more. Similar celebrations will be held annually for others of the employees whose service records are now approaching the 25 year mark.

Nordberg Mfg. Co. announces the appointment of **Albert E. Owen** as branch manager of the Toronto, Canada, office, located in the Concourse Bldg. Mr. Owen, a native of Belleville, Ont., replaces **M. T. Knutzen,** who has resigned. **Gordon A. Antenbring** will continue at the Toronto office as sales engineer and assistant to Mr. Owen.

Hercules Powder Co., Wilmington, Del., records the following changes in its personnel: **Kurt W. Jappe** has become manager of detonator operations of the explosives department; **William J. Austin** has been named director of purchases of the company; and **Frank W. Roman** replaces Mr. Austin as manager of the Chicago office.

BULLETINS

Compressors. Worthington Pump & Machinery Corp., Harrison, N. J., has published bulletin L-675-B1, illustrating and describing feather valve compressors, 75 to 3,000 hp.

Splint Dressing. B. F. McDonald Co., Los Angeles, Calif., has issued a descriptive circular on a new plant dressing for leg and hip fractures.

Rubber Conservation. American Steel & Wire Co., Cleveland, Ohio, has just published a new bulletin showing how to conserve rubber in insulated wire and cables.

Protective Hats. E. D. Bullard Co., San Francisco, Calif., has published a new folder on how to select hat protection.

Centrifugal Pumps. Ingersoll-Rand Co., New York, announces Bulletin No. 7167, containing illustrations, performance tables, and industrial applications of two-stage centrifugal pumps.

Truck - Mounted Crane. Link - Belt Speeder Corp., Chicago, Ill., has published book No. 1928 on a new model truck-mounted crane for use with hook block, clamshell bucket, or dragline bucket.

Ball-mill Liners. Eimco Corporation, Salt Lake City, Utah, has published a new folder on molychrome and cumocrome liners for ball, rod, or tube mills.

Ball Bearings. SKF industries, Inc., Philadelphia, Pa., has issued a brochure illustrating and describing how balls for bearings are made round.

Valve Maintenance. Manning, Maxwell & Moore, Inc., Bridgeport, Conn., have prepared folders telling how to make globe, safety, and relief valves last longer.

Truck Tire Engineering Service. Goodyear Tire & Rubber Co., Akron, Ohio, has published a booklet giving timely tips on the use and care of truck tires. Copies available gratis to truck operators.

Vari-Pitch Texrope Sheaves. Allis-Chalmers Manufacturing Co., Milwaukee, Wis., has published bulletin B-6-82-A, showing how to increase machine flexibility with quick, accurate change of speed.

Data Book for Pumps. Allis-Chalmers Manufacturing Co., Milwaukee, Wis., has just issued a 36-page compilation of complete engineering data on SSUnit and electrifugal pumps. Ask for Bulletin B-6018-B.

Rock Drilling Costs. Ingersoll-Rand Co., 11 Broadway, New York City, announces a new booklet, Form 2780, entitled "How Jackbits Reduce Rock Drilling Costs."

Tachometer. James G. Biddle Co., Philadelphia, has issued Bulletin 1710 describing the Jones heavy-duty hand tachometer—an instrument for measuring speed directly in revolutions per minute, or feet per minute. It is made for a range of speeds from 200 to 2,000 r.p.m.

Safety Equipment. E. D. Bullard Co., 275 Eighth St., San Francisco. A bulletin entitled "How to Encourage Eye Protection in Your Plant."

Dust Collector. American Foundry Equipment Co., 555 S. Byrkit St., Mishawaka, Ind. Catalog No. 82, describing the American high-efficiency (long-cone) cyclone dust collector.

Porcelain Wiring Methods. Porcelain Products Co., Findlay, Ohio. A one-page memorandum on savings of critical materials attained by use of porcelain wiring methods.

Shop Equipment. Ideal Commutator Dresser Co., 1277 Park Ave., Sycamore, Ill. A 4-page folder describing the "Triple-Duty" live-center, electric etchers, balancing ways, and other accessories.

Tool Brazing and Repair. Handy & Harman, New York. A two-page leaflet describing the reclaiming of costly tools by brazing with "Easy-Flo."

Oil Circuit Breaker. Roller-Smith Co., Bethlehem, Pa. Catalog 3130 covering Class 50-TC oil circuit breaker, 2-, 3- and 4-pole, 600-, 1,200-, 2,000- and 3,000-amp., 2,500-, 5,000-, 7,500-, and 1,500-v., and 50,000 kva. interrupting capacity. Pp. 12.

Meehanite Castings. E. Long Ltd., Orillia, Ont. Bulletin No. 12 pointing out the value of these castings in building mining and other equipment. It announces six bulletin covering six specific applications.

Safety Equipment. Mine Safety Appliances Co., Pittsburgh, Pa. Bulletin No. G-5 covering miscellaneous equipment for plant protection. Pp. 8.

Inclosed Motor. Crocker-Wheeler Electric Mfg. Co., Ampere, N. J. "Cowl-Cooled" squirrel-cage fan-cooled motor. Leaflet No. 117. Pp. 4.

Single-line Grab Buckets. Use of single-line grab buckets in handling ore, gravel, crushed coal, or sand is described in Bulletin No. C-27, now available on request to Harnischfeger Corp., Milwaukee, Wis. A series of close-up photos is given showing operation cycles and construction details.

Diesel Air Compressors. Clark 2-Cycle Right Angle Compressors are now available with diesel engine drive. Full information concerning operating economies obtainable with them is contained in a bulletin issued by Clark Bros. Co., Olean, N. Y.

Oil Purifiers. The Gale System of cleaning, clarifying, and reclaiming lubricating or cooling oils is described in two bulletins recently issued by Gale Oil Separator Co. Inc., Chrysler Bldg., New York, N. Y.

Mineralight Lamps. Excellent color reproductions of the appearance of fluorescent minerals under ultra-violet light feature the new catalog of Ultra-Violet Products, Inc., 5205 Santa Monica Blvd., Los Angeles, Calif. Methods are discussed of indentifying these minerals, and the full line of Mineralight Lamps is described. Prospectors and mineral collectors in particular will find this bulletin interesting.

Fordair Compressors. Catalog 4215 of Schramm, Inc., West Chester, Pa., describes a line of light-weight air compressors for various mountings and applications. Modified Ford-Mercury engines are used with two power and two air cylinders provided in each bank of the V-8 engine block. Performance data are included for several sample installations.

Hoisting Equipment. Coffing Hoist Co., Danville, Ill., has published general catalog No. G-6 describing its complete line of ratchet level hoists, electric and chain hoists, I-beam trolleys, load binders, and utility maintenance tools. Specifications, parts, and price lists are given.

Switchboard Instruments. Direct and alternating current indicating instruments are described in a new catalog issued by Roller-Smith Co., Bethlehem, Pa. All varieties of meters are included, and dimensions, weights, and prices are indicated.

Trucks like planes are weapons of war . . .

Keep your trucks in action with Mack Service

Vital to the war strength of the nation are the trucks that carry its goods. To conserve these trucks and to keep them working at peak efficiency is an urgent need of the times. At 70 Mack factory branches and 400 dealers throughout the country Mack-trained mechanics work with specialized service tools to "keep'em rolling." To insure the longest possible life for your trucks bring them to the nearest Mack branch or dealer. Consult your local Mack Service Manager about the Mack Preventive Maintenance Plan, a practical system of periodic check-ups which will save you money by correcting minor troubles before they develop into serious ones. Mack Trucks, Inc., Long Island City, N. Y.

Mack

THE MOST COMPLETE LINE OF TRUCKS IN THE WORLD—1 to 45 TONS AND ALL HEAVY DUTY